



# **NAVAL POSTGRADUATE SCHOOL**

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## **THESIS**

**HISTORICAL ANALYSIS OF THE BATTLE OF LITTLE  
BIGHORN UTILIZING THE JOINT CONFLICT AND  
TACTICAL SIMULATION (JCATS)**

by

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June 2004

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**HISTORICAL ANALYSIS OF THE BATTLE OF LITTLE BIGHORN  
UTILIZING THE JOINT CONFLICT AND TACTICAL SIMULATION (JCATS)**

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## **ABSTRACT**

The purpose of this thesis is to determine which of three competing theories of what occurred at the Battle of Little Bighorn is the most plausible by utilizing the Joint Conflict and Tactical Simulation (JCATS) program developed by Lawrence Livermore National Laboratory. There are many practical gains that JCATS can provide today's military with regard to training and educating soldiers for future conflicts. JCATS can be used to train soldiers in planning and executing missions in ways not feasible with conventional field training exercises utilizing live bodies and real vehicles. It is also increasingly being used for actual mission planning. However, very little has been done using JCATS to war-game past operations.

There are two points to be gained by using JCATS to model a historical battle such as the Battle of Little Bighorn. First, it validates the ability of JCATS to accurately model actual historical scenarios while identifying many of the specific limitations of the program. If the military is going to use computer simulations such as JCATS in lieu of field training exercises to train soldiers, it must first be determined if the program produces realistic results. Modeling an actual battle and comparing the results of the program with what actually occurred is one means of doing so. Second, modeling historical battles, particularly defeats, may assist in discovering lessons learned. In a field training exercise, a defeated force can be brought back to life and given another opportunity to apply the lessons learned from its previous defeat. Real battles afford no such opportunity. Computer modeling of past battles would allow military planners to isolate individual events and decisions and study their impact on the outcome.

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## **I. INTRODUCTION**

Know the enemy and know yourself; in a hundred battles you will never be in peril. When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant both of your enemy and of yourself, you are certain in every battle to be in peril.

Sun Tzu in "The Art of War," 500 B.C.

### **A. PURPOSE**

Much has been written about the Battle of Little Bighorn, quite possibly more than any other battle in history. However, because there were no survivors from Custer's five companies, any detailed account depicting actions of the battle relies heavily upon speculation. This lack of facts provided room for numerous theories and much debate.

In August 1983, a grassfire burned much of the vegetation covering the Little Bighorn battlefield exposing many previously undiscovered artifacts. The following year, archaeologist Richard A. Fox Jr. set out to examine the battlefield in an archaeological fashion. Using modern forensic investigative techniques to examine the artifacts discovered, he was able to piece together a detailed theory of his own about the progression of the battle as it occurred on that fateful day of June 25, 1876. In 2000, Navy Lieutenant Matthew Burns tested Fox's theory against the two carefully researched and documented theories of authors Steven Ambrose and John S. Gray as the subject of his thesis. He chose to compare the three competing theories of how the battle occurred utilizing the techniques provided in the U. S. Army's FM 101-5. His intent was to discover which of the three theories was most plausible. He found Fox's theory as the most likely, followed by Gray's, with Ambrose's being the least probable of the three.

It is the intent of this thesis to take that work a step further with the use of modern computer modeling techniques. We propose to answer the same question, "Which is the most probable account of how the battle of Little Bighorn occurred?" We attempt to model as accurately as possible the five companies from Custer's 7<sup>th</sup> Cavalry and the

Indian forces that fought on that day. It is our expectation that running multiple iterations of the three competing theories will further illuminate which of the three theories is most plausible.

Our decision to model the battle of Little Bighorn is two-fold. First, we must admit that we share the same simple curiosity and fascination with the battle that has captured the imagination of generations. However secondly, we feel that there are practical gains that computer conflict simulations can provide today's military with regard to training and educating soldiers for future conflicts. A variety of computer conflict simulation models are currently being used to train soldiers in planning and executing missions in ways not feasible with conventional field training exercises utilizing live bodies and real vehicles. They are also being increasingly used for actual mission planning. However, very little has been done using computer simulation to war-game past operations.

We think that there are two points to be gained. First, it would validate the program being used. If the military is going to use computer simulations in lieu of field training exercises to train soldiers, it would be helpful to know if the program produces realistic results. What better way to do this than to model an actual battle and see if the results match what actually occurred? Second, modeling historical battles, particularly defeats, may lead to discovering more detailed lessons learned. In training, a defeated force can be brought back to life and given another opportunity to apply the lessons learned from its previous defeat. Real battles afford no such opportunity. Computer modeling of past battles would allow military planners to isolate individual events and decisions and study their impact on the outcome.

## **B. BACKGROUND**

The battle of Little Bighorn was only one of fifteen battles that took place during the Great Sioux War; which occurred between March of 1876 and May of 1877 throughout the Northern Plains of America. A violation of the Fort Laramie Treaty of 1868 by the white settlers sparked the Indian unrest that led to the war. The discovery of precious resources, especially gold, prompted the desire to reclaim the land that had been given to the Indians in a treaty. The United States government tried without success to

find a legal reason to take back the land as thousands of whites flooded the Black Hills in search of gold. Finally, in an act of frustration, President Ulysses S. Grant ordered all Indians off their hunting grounds and back onto their reservations with the threat of force. Eventually, war was declared on the Sioux Indians under the pretext that the United States needed to protect the Crow Indians from Sioux Indian raiding parties.

The War Department tasked Brigadier General Alfred H. Terry to locate and return all Sioux and Northern Cheyenne Indians to their reservations. Brigadier General George Armstrong Custer commanded the 7<sup>th</sup> U.S. Cavalry Regiment, an element of Terry's larger force. When one of Custer's officers, Major Marcus Reno, discovered a large Indian trail leading west toward the Bighorn Country, Custer's battalion was detached from Terry's force to follow it. It was at this moment in time that Custer made what is argued by some to be the first of his mistakes. Custer decided to leave behind his Gatling gun platoon because he thought them too cumbersome to move at the speed he wished to travel. He also declined to take four additional companies offered to him from the 2<sup>nd</sup> Cavalry Regiment. Many speculate that this latter decision was due to Custer's reluctance to have his 7<sup>th</sup> Cavalry Regiment share the glory of the upcoming battle with any other unit. It was Custer's intent to trap the Indians between his force and the main element led by Brigadier General Terry, which included an Infantry Regiment and a Cavalry Regiment, as both men led their units into position. Their march began on May 17, 1876 and continued until June 24<sup>th</sup> when Custer's regiment discovered a large Indian trail described as "more than a mile wide" (Connell, 1984, p. 267). An excerpt from LT Burns' thesis describes the events as follows:

Eager to engage the enemy, Custer broke camp around 11 P.M. and led his regiment on a night march towards the Little Big Horn. It is important to note that the regiment had traveled some eighty miles in the last three days, on a limited amount of rest. Four hours later, at approximately 3 A.M., Custer ordered an extended break for the regiment. At this time, he received a report from Lt. Varnum confirming the existence of the suspected Indian camp.

The regiment was mobilized at approximately 8 A.M. on the 25<sup>th</sup> to begin making their way toward the river. Custer rode ahead to see firsthand the signs of the Indian encampment. Unfortunately, when he arrived at the

Crow's Nest, an ancient vantage point about fifteen miles east of the Little Big Horn, "...a haze had settled over the Little Big Horn and he could see nothing". (Ambrose, 1975, p. 431) Custer then returned to the regiment, which was halted at the divide between the Rosebud and the Little Big Horn, and received reports of possible sightings of Sioux scouts. At this point, he made the decision to attack immediately. His primary concern, it is clear, was that his approaching force had been spotted. Custer believed this would result in a dispersal of the Indian camp if he did not engage them as soon as possible. It was this belief that drove Custer toward the Indians, without considering the possibility of defeat.

In perhaps a manner that could have foreshadowed the confusion to come, Custer issued ad hoc orders to his company commanders (Graham, 1995, pp. 135, 157, 211). Captain Frederick Benteen and Companies D, H, and K were ordered to the south, presumably to cut off any escape routes in that direction. A pack train of supplies and ammunition was guarded by Captain Thomas McDougall's Company B, as well as small contingents from each of the other companies, and lagged behind the advancing columns. The rest of Custer's regiment continued towards the river, traveling along what is now known as Reno Creek. Another possible sighting of Sioux scouts compelled Custer to further split his forces, as he ordered Major Reno and Companies A, G, and M to cross the river and attack the Indian camp from the south. Meanwhile, Custer would move north along the river and, as he vaguely reassured Reno, support his attack.

Custer only retained five of the twelve companies under his command. This totaled 210 men out of the original 600. Although it is not certain that Custer ever observed first hand the size of the Indian force, he did send a message to Captain McDougall ordering the placement of the pack trains and another to Lieutenant Colonel Benteen ordering him to come quickly and bring the packs. This would seem to indicate that he realized he was about to engage a significant force. However, while moving to Custer's location, Benteen came across Major Reno's retreat in progress and decided that Reno's situation was more pressing than that of Custer's and decided to stay and assist Reno. Benteen even sent another messenger to the pack trains ordering that the movement of ammunition packs to Reno's position be quickened.

Custer's element was decimated at what is now referred to as "Last Stand Hill." There were no survivors from Custer's five companies and no one was able to observe the actions that took place during the fateful battle. Although we know in great detail the events that led up to the battle and the resting place of the dead; we do not know for certain the events that took place in between during this historic battle.

### **C. METHODOLOGY**

Our first step in building a model to test each of the three theories is to identify which of the conflict simulation programs available would provide the greatest level of detail and flexibility without jeopardizing reliability. We decided to utilize the Joint Conflict and Tactical Simulation (JCATS) program developed by Lawrence Livermore National Laboratory. We used version 4.1.0, the newest version available at the time of our thesis. The JCATS software allows for a greater level of detail, resolution, and integration of relational databases than any other conflict simulation software available. It is for this reason that it is the preferred computer based conflict simulation software for the Department of Defense in the Special Operations environment. After deciding upon JCATS, our next step is to learn the intricacies of the program and identify the information requirements. We studied the program manuals and received training from the JCATS developers at the Lawrence Livermore National Laboratory and Professor Paul West, an experienced JCATS modeler who currently heads the Department of Systems Engineering Simulations Center at the United States Military Academy at West Point.

Utilizing the forensic study of the battlefield provided by Fox, we were able to identify which weapons and munitions data was required to build our database for the JCATS program. We were fortunate in discovering official Ordnance Records published in 1879 that compared the accuracy of captured Indian rifles to the accuracy of the Springfield 1873 carbine with which Custer's battalion was equipped. The ballistics data included the mean horizontal and vertical deviation at various ranges, which we then used to calculate the Probability of Hit (PH) for each weapon, as taught by Brigadier General (Retired) Frank Giordano and Dr. Maurice Weir, authors of *Mathematical Modeling* and professors at the Naval Postgraduate School.

Our next task is to build each of the munitions, weapons, and individual combatants in the JCATS databases to exact detail. First, weapons characteristics such as the number of rounds each weapon can fire before reloading and the effective ranges of their respective munitions were researched and programmed. Next, we created each entity as either a cavalry soldier or Indian and assigned each entity with a weapon and munitions type. The individual entities were then grouped together in formations called aggregates. The aggregates were then positioned on a terrain database developed by the National Imagery and Mapping Agency (NIMA). This helps ensure the accuracy of the line of sight required for target acquisition and weapons effects as well as the ability of each entity to traverse the terrain. Our final step was to assign movement orders to the entities according to each author's theory and the work of Lieutenant Burns. We will run each theory ten times and analyze the output files produced by JCATS to determine how close the results of each simulation were to the known outcome of the actual Battle of Little Bighorn.

#### **D. LIMITATIONS**

While there are many things that can be accomplished by using a computer simulation that could not otherwise be easily replicated in the real world, it is important to understand the limitations of computer conflict simulation as well. This is particularly true when trying to replicate historical scenarios as opposed to capturing a trend. As Mr. Paul West from the System's Engineering Department at West Point told us, "When dealing with computer simulations, you have to remember that reality might be an outlier." In other words, the actual outcome of a particular battle may well have been one of those one in a million long shots that one could never expect to happen again in a thousand repeated simulations, let alone ten. There are numerous rogue events that could occur in reality changing the course of a battle to an outcome that could never be realistically simulated nor expected to occur again. For instance, there is currently no way to simulate the charismatic leadership that some individuals innately possess or the effects that may occur if those officers are killed early in battle rather than later. The example Professor West used to illustrate this point was the decisive influence exhibited by Chamberlain during the Battle of Little Roundtop at Gettysburg. Chamberlain's unit

was responsible for holding key terrain on the Union flank. Low on ammunition after repelling numerous assaults and in danger of being overrun, Chamberlain ordered an audacious bayonet charge that broke the Confederate attack and was able to continue defending his position until he could be reinforced. After the battle, one Confederate soldier recalled having Chamberlain dead in his sights, but something he couldn't quite describe prevented him from pulling the trigger.

Both Chamberlain's heroic leadership and the Confederate private's decision not to shoot had a significant impact on the outcome of the battle, but both would be difficult to represent with any degree of accuracy in a computer simulation. Battle involves flexible and decisive action from leaders. In a computer simulation, the entities can simulate neither human personalities nor situational awareness beyond their programmed field of view, range of engagement, and dictated movement orders. However, we find the inability to factor these characteristics into a computer model completely acceptable since a counter argument can be made that military planners do not take these factors into account when developing military plans for future operations, as specific units or commanders are often not identified at the time of a plan's conception. Instead, we are looking for trends over multiple simulations of the same events to provide data worthy of predicting a likely outcome.

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## **II. JCATS AND DATA INPUT CHOICES**

Our evaluation of Burns' thesis and initial literature review led us to identify two important requirements for the foundation of our simulation. First, we had to clearly identify the differences between the three competing theories and determine how to replicate them within the JCATS program. Second, and more important to the foundation, was replicating the weapons used on the battlefield in order for the simulation to be as accurate as possible.

### **A. TERRAIN AND ENTITY CREATION**

The first requirement was relatively straight forward with regard to research and data collection. It simply required us to read Burns' thesis and each of the authors' books to understand their competing theories. Programming each of the three theories into the simulation software using a terrain model of the battlefield provided by the National Imagery and Mapping Agency was more difficult. This was accomplished by creating each entity, whether it was an Indian or cavalry soldier, with the appropriate weapons and giving it a movement order consistent with each theory's logic. The difficulty with this portion of the preparation was mainly due to the finicky nature of JCATS. It is not a user friendly program and setting the system up often requires even the most experienced user to reload the program several times in order to get everything right, let alone a user with absolutely no experience with the system whatsoever. Fortunately, the analysts at Lawrence Livermore National Laboratory (LLNL) never failed to go out of their way to provide timely support for the numerous difficulties encountered while setting up the program. The second requirement, however, replicating the weapons used at the Battle of Little Bighorn, posed several unique challenges that could not be readily answered by technical support.

### **B. WEAPONS TYPES AND NUMBERS**

JCATS, as developed by Lawrence Livermore, was designed to simulate modern battles with a database comprised of current weapons, sensors, and platforms. Although it allows the user an extraordinary degree of flexibility in tweaking the capabilities and

ballistics characteristics of numerous weapons systems, it was not designed to replicate actual modern battles, much less a historical battle between mounted horse cavalry and plains Indians. For that reason, much attention is devoted to explaining our methodology for overcoming these unique problems.

First, several sources were consulted to identify the various weapons used on the battlefield. Determining the weapons used by the soldiers of the 7<sup>th</sup> Cavalry was relatively easy. Even though the soldiers of the 7<sup>th</sup> Cavalry were allowed the option of purchasing their own firearms, the overwhelming majority of them were armed with the standard issue Springfield Model 1873 carbine and the Colt Model 1873 Single Action Army revolver. Although there were a few notable exceptions, such as the “Remington .50-caliber sporting rifle with octagonal barrel and two revolvers that were not standard issue—possibly Webley British Bulldog, double-action, white-handled revolvers” (Shulman, 1998) that Custer is thought to have carried, these were not deemed to have affected the outcome in any significant way and were therefore not included in our study. Sabers were left behind for this campaign in order to eliminate the rattling noise they made while riding and were likewise not included in the study. The only weapons modeled for the cavalry were the Springfield Model 1873 carbine and the Colt Model 1873 Single Action Army revolver.

Modeling the weapons for the Indians proved to be a much more painstaking task due to the wide variety of weapons they used. The main resource consulted for determining this information was *Archaeological Insights into the Custer Battle*, a book by Douglas D. Scott and Richard A. Fox, Jr. detailing the finding of the archaeological study conducted in 1984. Using metal detectors to locate artifacts from the battle, Scott and Fox went on to examine each bullet and shell casing found in an attempt to determine not only the various types of weapons used, but also the number of each. An effort was also made to try to track the movement of individual weapons across the battlefield by examining the firing pin and extractor markings on each shell casing the same way police do today when investigating crimes. Many other sources were also consulted in an attempt to obtain detailed weapons data, but Scott and Fox’s was the most beneficial in attempting to determine how many weapons of each type were present at the

battle. The details of our methodology are outlined in Appendix A, but our final decision was to use the estimate given by Scott in a separate article he authored with Melissa A. Connor titled “Post-mortem at the Little Bighorn.” In it they estimate

...that if 1,500 Indian warriors took part in the battle..., then about 375 would have been armed with muzzle-loaders and single-shot rifles such as Sharps and Ballards, and about 192 would have been armed with repeating weapons. The rest may have used bows and arrows and a few old pistols and revolvers.

Using this as a starting point, we then further subdivided the two categories of firearms, repeaters and single-shots, using the same method of extrapolation that Scott and Fox used to obtain their estimate of 192 repeaters. This methodology is explained in Appendix A, but the results are as follows:

Repeating Rifles

|                       |           |
|-----------------------|-----------|
| Model 1860 Henry      | 85        |
| Model 1866 Winchester | 85        |
| Model 1873 Winchester | <u>22</u> |
| Total                 | 192       |

Single-shot Rifles & Muzzle-loaders

|                            |            |
|----------------------------|------------|
| Sharps .50                 | 78         |
| Springfield .50            | 16         |
| Muzzle-loader (Rifled)     | 140        |
| Muzzle-loader (Smoothbore) | <u>141</u> |
| Total                      | 375        |

The first adjustments made to these numbers was a bit of rounding up in order to account for the fact that several of the positions that the Indians are known to have fired from were outside the area examined by Scott and Fox. For the repeaters, both the Model 1860 Henry and the Model 1866 Winchester were rounded up from 85 to 100. The Model 1873 Winchester was rounded up from 22 to 25. This gives the Indians a total of 225 repeating rifles. This is still 150 less repeaters than the 375 one would arrive at if one used the 25 percent estimate given by Charles Windolph of Company H (Scott and Fox, 1987). We chose to start out on the lower end of the spectrum in order to use the conditions most favorable to Custer as a starting point for each of the three scenarios. For the single-shot and muzzle-loaded rifles, the Sharps .50 was rounded up from 78 to

80, the Springfield .50 down from 16 to 15, and the muzzled-loaders were set at 140 each for both the rifled and the smoothbore. This put the total of this group of weapons at exactly 375. Out of 1,500 Indians, this would leave the remaining 900 armed with bow and arrows. We opted to arm 50 of these 900 with the Army's Model 1873 Springfield carbine to represent weapons that were captured during the course of this battle and from the Battle of Rosebud that had occurred eight days earlier. Although the three different theories use different estimates for the number of Indians involved, we opted to keep the number at the generally accepted minimum of 1500 for each of the three scenarios for control purposes. As stated earlier, we wanted to begin each of the three scenarios under the most favorable of conditions for Custer's forces.

### C. BALLISTICS

Once the number of each type of weapon was determined, the next step was to obtain detailed ballistics information about the various weapons. JCATS requires the user to input specifics such as range, muzzle velocity, magazine capacity, reload time, and the probability of achieving a hit at various ranges. The most important, and most difficult to calculate, were the PH/PK (probability of a hit/probability of a kill) curves. Below is an example of a default PH table taken from JCATS to better explain how JCATS uses this data during a simulation.

| <b>Range(m)</b> | <b>SSDF</b> | <b>SSEF</b> | <b>SMDF</b> | <b>SMEF</b> | <b>MSDF</b> | <b>MSEF</b> | <b>MMDF</b> | <b>MMEF</b> |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 0               | 45          | 90          | 0           | 95          | 59          | 70          | 0           | 29          |
| 200             | 40          | 80          | 0           | 85          | 29          | 40          | 0           | 14          |
| 400             | 29          | 59          | 0           | 65          | 10          | 20          | 0           | 1           |
| 800             | 20          | 40          | 0           | 45          | 1           | 10          | 0           | 0           |
| 1500            | 10          | 20          | 0           | 25          | 0           | 1           | 0           | 0           |

Table 1. Default PH data from JCATS

In the left column is the range in meters for the data provided for each four letter code in the other columns. The four letters represent each of the possible combinations of an engagement between any two entities. The first letter signifies the status of the shooter. The letter “S” indicates the shooter is stationary while an “M” indicates the shooter is moving. The next letter represents the status of the target. Again, an “S” means the target is stationary while an “M” denotes that the target is moving. The third letter signifies the posture of the target, an “E” for exposed or a “D” for defilade. The fourth letter represents the type of shot. The choices are “F” for a flank shot or “H” for a head shot. However, in JCATS, all shots against troops are considered “F” flank shots (LLNL, p. 7-12). The head shots only pertain to target groups such as armored vehicles and were not used in our scenario. The numbers under each four letter heading represent the probability of achieving a hit at that particular range. When graphed, this provides a probability curve. For example, in the chart shown above, there is a 65% probability of a stationary shooter hitting a moving target at a range of 400 meters. During the simulation, when an entity fires at a target, the computer goes to the appropriate PH chart for the weapons system used and extracts the data necessary for that particular engagement. Next, the simulation generates a random number to determine a hit or miss based upon the table’s percentage. If it is not hit, the simulation continues with no degradation to the target. If the target was hit, then the computer will go to a similar table to determine whether the target is killed.

Our first step was to establish a baseline capability of each weapon. Not all of this data was readily available and our methodology in choosing each of these variables is outlined in Appendix A. The data for the Army’s Model 1873 Springfield carbine and the Indian’s Model 1866 Winchester were available from comparison tests conducted in 1879 and documented in *Ordnance Notes No. 115*. Data for the Springfield and Sharp’s rifles were also included, although they were of a different caliber than of those documented by Scott and Fox to have been used in the battle. Utilizing the data found in *Ordnance Notes No. 115*, we converted the standard deviations to probable errors in vertical and horizontal deflection. The method of calculation used is documented in Appendix A.

We initially intended to compensate for the human factor by examining the PH tables for the weapons systems already included in JCATS. We figured that even though the technical data for the weapons we were modeling would be different, the variations in PH ratios when calculating the odds of hitting a moving versus a stationary target should be about the same. However, after examining the PH/PK values in JCATS, many inconsistencies in the PHs were discovered. Further investigation revealed that JCATS includes a disclaimer in their documentation that stating “sample PhPk files are unclassified and are not guaranteed by the CSL or LLNL”. Simply translated, this means that someone using JCATS should not trust the default settings to accurately represent the characteristics and capabilities of the weapons systems included with the program. The results produced by JCATS will only be as good as the initial input data that is fed into it, or, in the lingo of computer programmers, garbage in results in garbage out. Ultimately we were forced to rely not only upon our own research, but also our experience as soldiers and marksmen to estimate the effect that shooting at a moving target, both while moving and stationary, would have on the PHs.

We soon discovered that there is a dearth of information on the degradation in the probability of hitting a target once the target, the shooter, or both start moving. Phone calls to the Army Marksmanship Unit, Army Research Institute, Battle Lab, and the Malone Moving Target Range complex all failed to yield any credible statistics that one could use to calculate the probability of hitting a moving versus a stationary target. One article was finally discovered in the July-August 1987 edition of *Infantry* magazine. In it, an article titled “Marksmanship Training” by Joel D. Schendel cites the finding in an experiment where basic trainees were tested on a target range after receiving instruction designed to improve their performance. The range included both moving and stationary targets.

The stationary targets appeared at ranges between 25 and 300 meters, the moving targets at ranges between 15 and 185 meters. All of the moving targets moved at 45 degrees relative to the firer at four (185 meters only) or eight meters per second. Overall, these soldiers averaged 27 percent hits against moving targets and 37 percent hits against stationary targets. Hits against moving targets equaled 28 percent at 75 meters, 23 percent at 125 meters and 15 percent at 185 meters.

Even when seven shooters from the Running Target Branch, U.S. Army Marksmanship Unit (AMU), fired this scenario twice (the first time for practice), the number of hits against moving targets fell off rapidly at ranges beyond 35 meters. Only half the moving targets presented at 75 meters were hit and this number decreased to 39 percent at 125 meters and 32 percent at 185 meters.

The degradation statistics given for seven shooters from the Army Marksmanship Unit were used as a baseline for the SMEF (Stationary shooter, moving target) column of the PH tables. These numbers were chosen because we wanted the PH tables to represent the capabilities of only the weapon itself, not those of the shooter. JCATS has a separate area to define the capabilities of the soldiers and we wanted to keep the two variables separate as much as possible. Although this is impossible to do with regards to engaging moving targets, we reasoned that soldiers from the Running Target Branch of the U.S. Army Marksmanship Unit should have performed as close to perfection as possible. Therefore the numbers cited in the *Infantry* magazine article should represent a near perfectly trained marksman shooting a perfectly maintained weapon.

Our next step was to determine if the percentages entered into our new PH table reflected a realistic level of accuracy for each weapon. Graphs using Microsoft's Excel spreadsheet software were created to see a graphical representation of each weapon system's probability of a hit over distance (see figure below). Although we were not fortunate enough to have detailed ballistics data for each weapon, graphing the PH data in this manner at least allowed us to view each weapon's accuracy at various ranges with respect to each other. We wanted to ensure that we had not entered in data that did not pass the common sense test such as smoothbore muzzleloaders outperforming rifled carbines and repeaters.

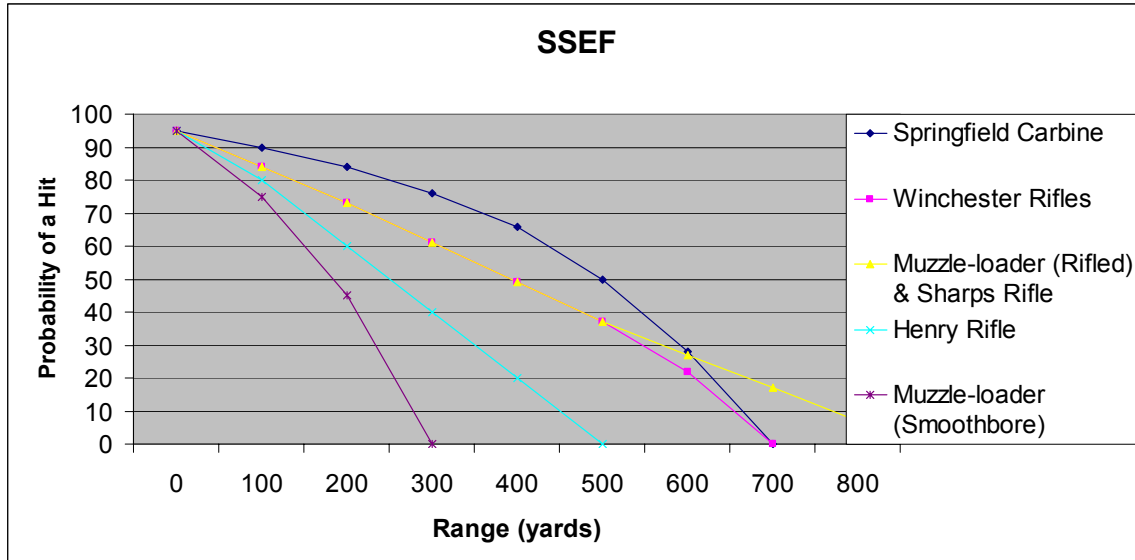


Figure 1. PH Comparison Graph.

Although the chart shows the weapons systems ranging out to over 800 yards, the Indians would not likely engage a target unless at fairly close range. Therefore, we needed to limit the engagement range during the simulation. We found that the JCATS simulation would allow an entity to engage a target as long as it was within the line of sight of the shooter and within the range of the weapon system. We controlled the engagement ranges of the simulation by changing the maximum range of the weapons to a lower value than the weapon itself could fire. This made the longer ranges of the PH tables irrelevant and kept the entities from engaging each other at unrealistic ranges. We then tested this approach by taking a reduced ratio of Indians to cavalry and placed them on the terrain at Little Bighorn outside of the maximum engagement range of the farthest shooting weapon. Next, we had both sides move towards each other and watched to see at what ranges the entities engaged each other. The data for each round fired is stored to a data file for detailed study. This method allowed us to simulate the realistic ranges for weapons engagements that were reported to have occurred on the battlefield.



This covers the initial settings most relevant to the outcome of our simulation. A detailed enumeration of our initial parameters for each theory is outlined in Appendix B. The two sides were now formed and armed. The next step was to place the combatants on the terrain model and give them movement orders consistent with each of the three authors' respective theories.

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### **III. THE THREE THEORIES**

#### **A. THEORY SELECTION**

As stated earlier, this thesis is a continuation of the work started by Matthew Burns. His choice to compare the theories contained in the works of the three authors selected was not random. He felt that certain criteria needed to be met in order for a hypothesis to be worthy of consideration. He felt that a theory should do “more than state the obvious facts and offer a vague summary of what might have happened during the disputed stages of the battle” (Burns, p. 16). His thesis

... established three key criteria for the selection of theories for modeling. First, the theory must have a sufficient level of detail. In order to construct the model consistent to the source theory, the theorist must have offered details concerning the movement/location of Custer’s force prior to the battle, the size of the Indian force, the location where the actual fighting started, and the movement of both sides during the battle. Any theory without these variables would rely too much on independent extrapolation or assumptions of the modeler. Second, the theory must be an academic effort, with either science or primary and secondary sources as its foundation. Given the extensive collection of Little Big Horn literature, many theories are pure conjecture and selection from among those would be arbitrary at best. Last, the theories selected must be dissimilar enough to present an interesting cross section of informed analysis on the subject.

#### **B. JOHN S. GRAY**

First, it is important to note that although we have chosen to use the term theory to describe each author’s approach, Gray himself is reluctant to do so and would prefer to use a more vague or ambiguous term. In his book titled *Custer’s Last Campaign: Mitch Boyer and the Little Big Horn Reconstructed*, John S. Gray writes that his, “counterclockwise hypothesis, cannot qualify as a theory, for it is only a trial hypothesis, to be checked against further evidence” (p. 395). Gray’s theory goes into great detail in describing the events leading up to “The Final Minutes,” as Chapter 25 of his book is named. He even goes so far as to not only extrapolate the speed at which whole units traveled, but also specific individuals such as couriers as well. He accomplished this by analyzing in detail numerous first hand accounts of the battle. He then compared the

testimony given by various individuals of what they saw from various vantage points at specific times and correlated the information to develop a very precise timeline. Gray then measured the distance between sightings to determine the rate of movement for the various units and individuals. As far as the final minutes are concerned, Gray concedes that any explanation offered would be merely speculative. He does feel, however, that “a search for evidence that imposes constraints may at least reduce the possibilities to a finite number” (1991, p. 384). He further states that, “[s]ince there is more evidence on where the killing action occurred than on any other aspect, [he is] prompted to focus on this dimension and see what may be inferred from it.” (1991, p. 384).

At the end of Chapter 23, which describes the final moments leading up to the end of Custer’s fight, Gray describes Custer’s five companies as being reunited on the reservation at 4:46 pm and states that they will all be dead in 39 minutes. This provides us with his interpretation of the length of the final battle. It is interesting to note that although Gray makes several references to the archeological work conducted by Fox; he never mentions Fox by name. Gray notes that the study was not published at the time of his writing and that he would therefore not comment on the artifacts found. Although he laments the fact that the archeological map developed from the position of the artifacts and burial markers “shows no geographical features, nor a single coordinate line; only metric numerals are printed on the margins with no mark to place the coordinate lines” (Gray, 1991, p. 386), he nevertheless uses Scott and Fox’s map as an aide to developing his theory. Gray conducted some rather creative mathematics in applying the findings to an actual map and estimates that his results should not be off any more than 15 meters. This allowed Gray to observe how the markers are spread throughout the battlefield with relation to each other.

Gray’s final minutes began with Custer’s five companies entering the reservation from the south, very close to Calhoun Ridge. He deployed a squad to the west end of Calhoun Ridge to defend against approaching Indians while the rest of the regiment moved to the high ground on top of Calhoun Ridge. Gray interprets the layout of the markers as seeming to indicate that some of the heaviest of the fighting occurred where the squad was deployed. Gray feels that Custer’s forces traveled in a counterclockwise

direction from Calhoun Ridge to Custer Ridge, then Custer Hill followed by the South Skirmish Line and finally the west perimeter. He then calculates the rate of movement to be about 6 miles per hour. This allows for 17 ½ minutes of halts for fighting and 17 ½ minutes of movement to complete the 1 ¾ mile perimeter. This accounts for a total fighting time of 35 minutes once Custer's forces reached Calhoun Ridge and started their movement around the perimeter.

Gray also suggests the possibility that there were two final stands that may have occurred simultaneously, one being the famous Custer's last stand at Custer Hill, and another involving 14 fleeing soldiers from the South Skirmish Line that die along the west perimeter. He describes Custer Hill as most likely only being large enough to support two companies and speculates that Custer sent a defensive force towards what is now known as the South Skirmish Line because Indians may have been spotted coming from the northwest first. Later, after observing Indians attacking Custer Hill from the northeast in what has come to be known as the Last Stand, these final 14 soldiers attempt to flee away from Custer Hill towards the west perimeter. The soldiers represented by the 14 markers on the west perimeter would have been making their last stand at about the same time the forces still on Custer Hill were making theirs. The map below depicting the battle according to Gray is taken from Burns' thesis.

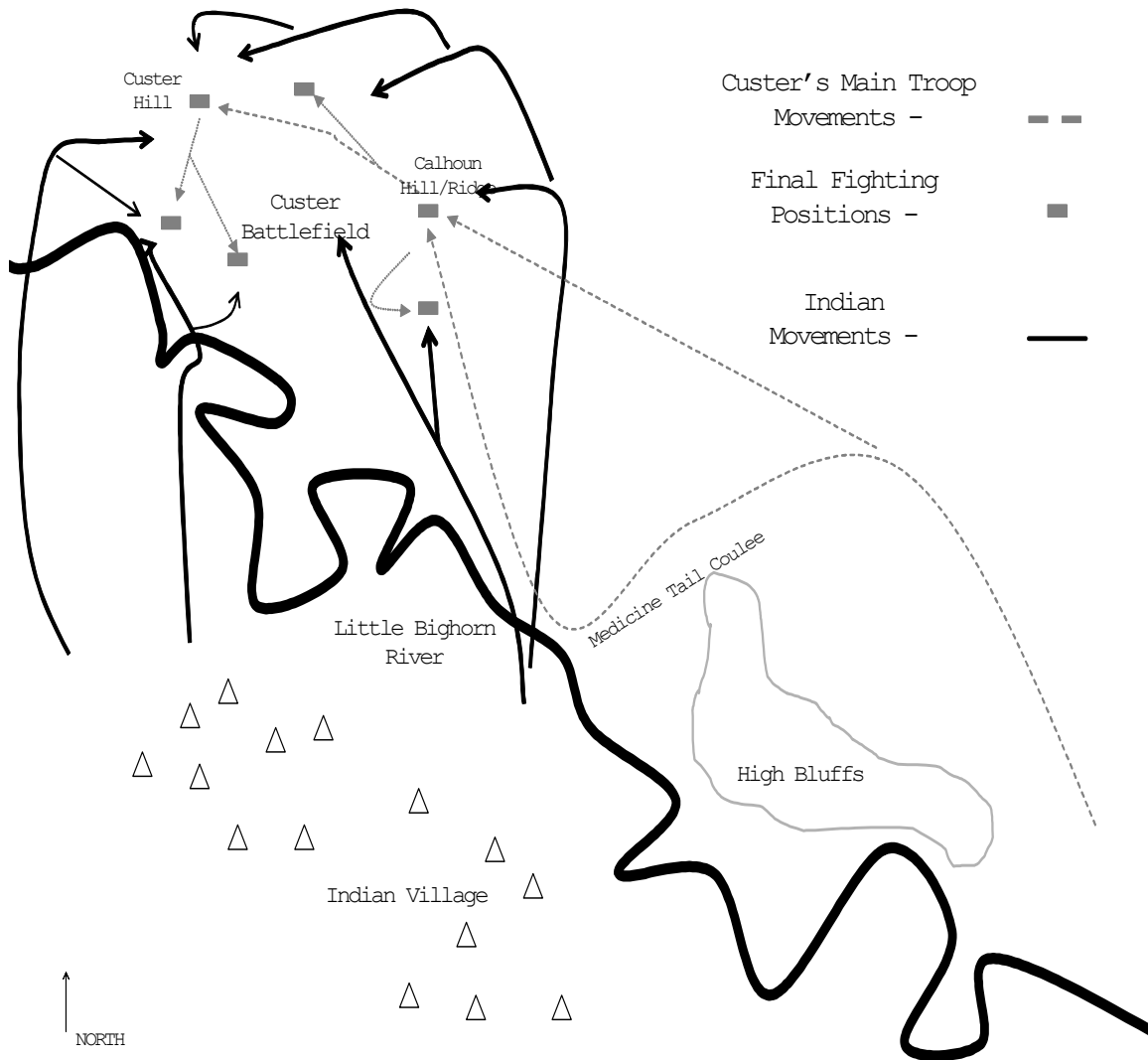


Figure 2. Actions at Little Bighorn According to Gray

### C. STEPHEN E. AMBROSE

Stephen Ambrose's theory was included by Burns due to its historical relevance. It was written more than a quarter of a century ago and does not benefit from the archeological discoveries that Fox's or Gray's theories do. It is, however, as Burns puts it, "representative of the traditional view" (Burns, p. 23). Ambrose's book, *Crazy Horse and Custer*, is a parallel biography that follows the lives and development of both warriors that culminates with the Battle of Little Bighorn and their actions as leaders on the battlefield there. He attributes a great deal of the credit for Custer's defeat to Crazy Horse.

Ambrose's assessment of the battle estimates the number of Indians to be close to 3,000 warriors in all, separated into two engagements. The first engagement is against Reno's forces to the south as he attacked the Indian village in an attempt to force the Indians to flee to the north where Custer would be waiting. Ambrose believes that Crazy Horse had learned how the white man fought and anticipated Custer's flanking move. He theorizes that Crazy Horse withheld his warriors from the first fight with Reno in expectation of Custer's main attack. According to Ambrose, Custer traveled down Medicine Tail Coulee towards the river when he was met by a blocking force of 1,500 Hunkpapas warriors which forced him to turn to the right and head for the high ground. Ambrose states that "[a]t this point Custer realized, probably, that he was no longer on the offensive. Suddenly he was in a fight for survival" (Ambrose, 1975. p. 440). He believes that Custer led his forces directly to what is now known as Custer Hill in hope of setting up a defensive perimeter where he could hold out until reinforcements arrived. His forces were stretched out while being chased under fire by Gall's 1,000 Indians. Meanwhile, according to Ambrose, Crazy Horse led another 1,000 Indians around the backside of Custer Hill beating Custer to the top. Ambrose states that "[w]hat Crazy Horse saw before him was a long slope with a few more than 200 soldiers on it. With their backs to the top of the hill, they were fighting for their lives, most of them horseless by now, many wounded, hard pressed by Gall's force" (p. 442). According to Ambrose, Custer and his forces never reached the top of the hill. This theory deviates from normal Indian tactics in two major ways; a point that is acknowledged by Ambrose. First, "Crazy Horse was getting the warriors to ride away from the scene of action, something no one had ever been able to get them to do before" (Ambrose, 1975. p. 440). This is a reference to the engagement with Reno's forces to the south where the Indians were having great success. Second, "[i]n an Indian-versus-Indian battle, flanking was not necessary, in fact, it did not fit into the scheme of things, as the object in an Indian fight was to win honors, not kill enemies" (Ambrose, 1975, p. 445). In fact, Ambrose goes on to observe that "[i]n military affairs it is exceedingly difficult to outflank a flanking force, but when it is achieved it is usually spectacularly successful" (Ambrose, 1975, p. 445). Although it would have been highly unusual for the Indians to organize and fight in this

manner, this does not automatically discredit his theory, as there have been many examples of leaps in military tactics throughout history. Captain Horatio Viscount Nelson's divide and conquer technique used at the Battle of Trafalgar and the unconventional approach of T.E. Lawrence, better known as Lawrence of Arabia, are two examples that immediately come to mind. The map on the next page depicting the battle according to Ambrose is taken from Burns' thesis.

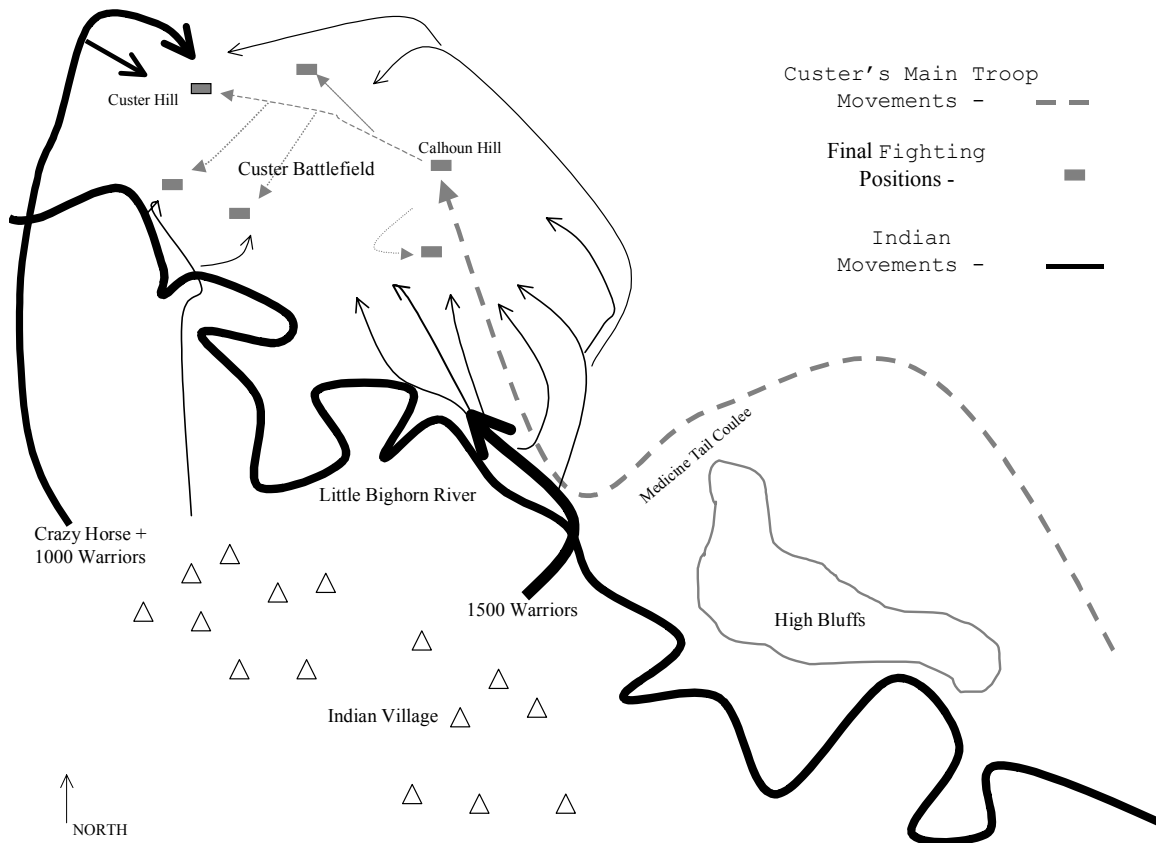


Figure 3. Actions at Little Bighorn According to Ambrose

#### D. RICHARD A. FOX, JR.

The third theory is provided by Richard Allan Fox, Jr. Fox's two-year archeological survey of the battlefield is a revolutionary approach to studying historical battles. As noted earlier, John Gray stated that Fox's report lacked detailed grid locations rendering the findings difficult to study and that this was probably due to pressure from outside sources that wanted to avoid publicizing precise locations that could possibly lead



to vandalism and destruction of the site. This would appear to be true since Fox's team used electronic surveillance equipment that automatically recorded an items description, depth it was found at, grid coordinates, orientation of the object, and then assigned it a catalog number. This way a detailed survey map was created as items were found rather than after the fact. Each item was placed in a presorted catalog numbered bag that corresponded to the computer assigned catalog number. Based on these findings, Fox created a model that he calls Tactical Stability.

Fox's Tactical Stability model is based on the standard cavalry tactics of the time where soldiers would fight with a standard 5 yard separation between individuals and a 15 yard separation between each four man squad. This tactic was used to provide an effective means of control during combat. He sought to discover whether or not tactical stability existed by studying the ejected shell casings. He hypothesized that if a group of shell casings were found with approximately 5 yard separation between weapons, then evidence of tactical stability existed. Fox then attempted to track the movement of individual weapons by analyzing the unique firing pin markings on each shell casing. Whenever he found groups of shell casings from different weapons that were closer together and but fewer in number, he interpreted this as a sign of disintegration of Tactical Stability. According to Fox, this occurs when men begin to bunch in together under stressful situations from enemy fire. This unintentional action is the result of losing their tactical discipline and wanting to feel safer by getting closer to each other. This can result in eventually fleeing under fire and in some cases, even throwing one's weapon to the ground while running away. Fox analyzed the pattern of the shell casing against his tactical disintegration model to create his theory of the events at little Bighorn.

According to Fox, Custer separated his forces into two wings. The right wing commanded by Captain Keogh consisted of companies C, I, and L. The left wing was commanded by Captain Yates and included companies E and F. Custer and his headquarters element went with the left wing. Fox agrees with the other three theories in their assessment that Reno's force was sent to attack from the south and failed to make an aggressive or convincing attack. Meanwhile, Custer intended to move to the north in an attempt to flank the left side of the Indian village. However, Fox believes that his intent

was to take the women and children hostage in order to force the braves to return to their village, not to act as a blocking force for Indians fleeing from Reno's attack. Fox acknowledges Custer's force reaching the Ford B site at the river and says that they did not cross. From there, Fox has Custer's left wing moving further north than anyone has ever placed him to a second crossing point at Ford D. There, they met with heavy resistance and moved towards the high ground eventually making their way to Custer Hill. Meanwhile, the right wing had moved to Calhoun Hill where it too was met with heavy Indian resistance from the south and west. According to Fox, the shell casings show that tactical stability was lost and men started fleeing across Custer Ridge towards Custer Hill as more Indians began to attack from the east, south and west. Finally, when Custer Hill is attacked from all direction, the remaining survivors flee down deep ravine. Fox discounts that there was ever a South Skirmish Line in any sense of a planned tactical formation. He believes that those who died along what is commonly called the South Skirmish Line did so while fleeing. He bases his opinion on the lack of a significant number of shell casings found along the way. The map on the next page depicting the battle according to Fox is taken from Burns' thesis.

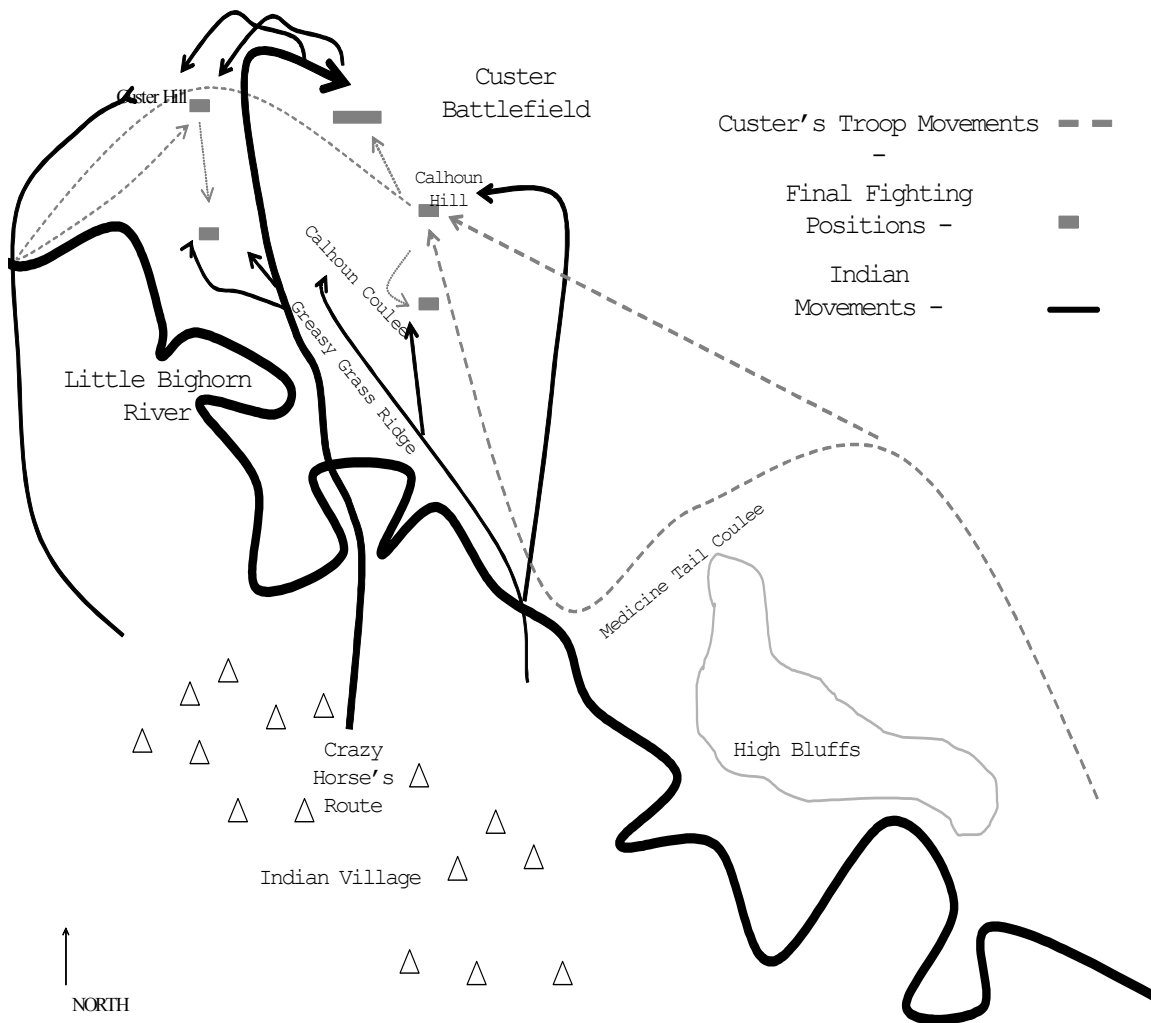


Figure 4. Actions at Little Bighorn According to Fox.

## E. SUMMARY OF THEORIES

Each of the three theories has some obvious flaws that should be addressed. John Gray's theory lacks much of the evidence found in Fox's research as well as the detailed tracking of weapons across the battlefield. Steven Ambrose's theory was created prior to the discovery of archeological evidence that Fox and Gray both base much of their theories on and makes a huge strategic and tactical leap of faith with regards to Crazy Horse's abilities as a leader. Fox's work, although extremely detailed, does not account for the fact that the Indians often picked up shell casings since they often reloaded their own rounds. The Indians and their families had two days to scour the battlefield recovering their dead, stripping the soldiers of useful possessions, and most probably

picking up spent cartridge cases for future use. The two strongest theories appear to be those of Fox and Gray. The main strength in Fox's theory lies in his detailed forensic analysis of the artifacts discovered on the battlefield. Gray's main strength lays in his detailed analysis of the timeline and his attempt to piece together a minute by minute account of locations and rates of movement by studying minute clues from numerous accounts of the battle. Gray had the additional advantage of formulating his theory of what occurred after Fox had completed his archeological study and was therefore able to also use this information in reaching his conclusions. It was for this reason that we chose to model Gray's account of the battle first.

## **IV. JCATS RESULTS AND CONCLUSIONS**

### **A. DIFFICULTIES ENCOUNTERED**

Once the three theories were modeled into JCATS, the technical difficulties almost became overwhelming. Some of these were due to shortcomings in the program. Others were due to the fact that we were attempting to use the program for a purpose it was not originally designed to perform. A few were also due to operator error. After running the scenarios through all their iterations for the first time, we discovered that the 7<sup>th</sup> Cavalry only had 205 troopers instead of 210 and 100 Indians armed with Henry repeating rifles never fired their weapons.

The five missing cavalry troopers were quickly determined to be the four civilians accompanying Custer on his march and the battalion surgeon, Dr. George Lord. We originally planned to model these five individuals differently than the rest of Custer's troopers, but instead wound up failing to include them at all. Two of the civilians were the scouts, Mitch Bouyer and Custer's brother, Boston Custer. The other two civilians were Mark Kellogg, a reporter for the Bismarck Tribune, and Custer's nephew, Harry Armstrong Reed, often referred to as "Autie." The two scouts and Custer's nephew were most likely engaging targets with the rest of the regiment. The surgeon, however, was most likely treating wounded and the role the news correspondent played is unknown. We eventually concluded that the absence of these five individuals would have no significant effect on the outcome.

It was determined that the one hundred non-firing Indians, on the other hand, would have a very significant effect on the outcome. Fortunately, it was an easy fix. The ammunition assigned to their weapon system, the Henry repeating rifle, had been assigned a non-existent PH value. The scenarios were then once again ran through ten iterations each. This time the problem lay in the reports generated from the Analyst Workstation files. The Analyst Workstation the part of the JCATS program where one can observe and replay the engagements that have occurred. JCATS is designed to generate a series of easy to read reports based on this data. Examples of the reports

resulting from our third batch of runs are included in Appendix C. After running through the entire simulation sequence for a second time, we were not able to observe the results in the Analyst Workstation, nor were we able to generate the necessary reports. We were unable to determine the cause of this failure, but it was most likely due to the mixing up of files while moving the data among several different computers. We finally ran through the entire sequence a third time.

## B. JCATS RESULTS

While analyzing the output data from the third sequence of runs, a new inconsistency was noted. While recording the ending time for each of the battles, we noticed that in some of iterations, the last person killed last was sometimes an Indian instead of a Calvary soldier. In one case, 129 Indians were killed after the last cavalry trooper. A closer analysis revealed that at the end of some of the battles, one of the cavalry troopers would continue to engage Indians even after the last trooper had supposedly been killed. We were unable to ascertain the cause of this anomaly. However, we were able to eliminate the error in output that it produced by simply disregarding all Indian casualties that occurred after the last cavalry trooper had been killed. We also based the ending time of the battle on the time that the last cavalry trooper was killed. The following tables illustrate the changes that were made. The times are represented in whole minutes and decimals, not minutes and seconds.

|         | Run<br>1 | Run<br>2 | Run<br>3 | Run<br>4 | Run<br>5 | Run<br>6 | Run<br>7 | Run<br>8 | Run<br>9 | Run<br>10 | Average |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|---------|
| Ambrose | 27.4     | 34.05    | 34.53    | 34.49    | 34.5     | 27.5     | 34.61    | 34.17    | 34.76    | 34.58     | 33.059  |
| Fox     | 28.2     | 28.59    | 27.86    | 30.58    | 37.1     | 44.28    | 28.15    | 28.03    | 29.67    | 27.96     | 31.042  |
| Gray    | 40.01    | 39.09    | 37.95    | 37.44    | 36.37    | 36.33    | 36.27    | 37.46    | 37.86    | 37.98     | 37.676  |

Table 2. Duration of Battle (Original)

|         | Run<br>1 | Run<br>2 | Run<br>3 | Run<br>4 | Run<br>5 | Run<br>6 | Run<br>7 | Run<br>8 | Run<br>9 | Run<br>10 | Average |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|---------|
| Ambrose | 27.4     | 27.35    | 27.45    | 27.38    | 27.46    | 27.5     | 27.44    | 27.32    | 27.4     | 27.37     | 27.407  |
| Fox     | 28.06    | 28.59    | 27.86    | 27.99    | 27.95    | 44.28    | 28.15    | 28.03    | 29.67    | 27.96     | 29.854  |
| Gray    | 36.28    | 37.51    | 37.95    | 37.44    | 36.37    | 36.33    | 36.27    | 37.46    | 37.86    | 37.98     | 37.145  |

Table 3. Duration of Battle (Adjusted)

The changes had the biggest impact on Ambrose's theory. Eight of the ten Ambrose iterations required adjustment. Changing the end time to the time the last cavalry trooper was killed in these eight iterations the lowered the duration from between 34 and 35 minutes to between 27 and 28 minutes. This lowered average duration of the battle by about 6 minutes from approximately 33 minutes down to 27 minutes. The next largest change occurred with Fox, which required three of the ten iterations to be adjusted. The average duration of the Fox battles was only reduced by a little over a minute, from 31 minutes down to little less than 30 minutes. Only two iterations for Gray were adjusted resulting in an overall average change of only about half a minute.

|         | Run<br>1 | Run<br>2 | Run<br>3 | Run<br>4 | Run<br>5 | Run<br>6 | Run<br>7 | Run<br>8 | Run<br>9 | Run<br>10 | Average |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|---------|
| Ambrose | 691      | 724      | 814      | 703      | 776      | 701      | 860      | 811      | 705      | 736       | 752.1   |
| Fox     | 63       | 168      | 37       | 174      | 96       | 36       | 46       | 151      | 80       | 92        | 94.3    |
| Gray    | 285      | 75       | 147      | 95       | 199      | 99       | 85       | 145      | 173      | 245       | 154.8   |

Table 4. Indians Killed (Original)

|         | Run<br>1 | Run<br>2 | Run<br>3 | Run<br>4 | Run<br>5 | Run<br>6 | Run<br>7 | Run<br>8 | Run<br>9 | Run<br>10 | Average |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|---------|
| Ambrose | 691      | 666      | 692      | 636      | 711      | 701      | 731      | 749      | 641      | 673       | 689.1   |
| Fox     | 62       | 168      | 37       | 149      | 32       | 36       | 46       | 151      | 80       | 92        | 85.3    |
| Gray    | 279      | 71       | 147      | 95       | 199      | 99       | 85       | 145      | 173      | 245       | 153.8   |

Table 5. Indians Killed (Adjusted)

The adjustments did not have a significant impact in the average number of Indians killed in any of the theories. As with the duration, the largest change occurred with Ambrose. The average number of Indians killed dropped by 63, from 752.1 to 689.1. This also helped to reduce the wide range in the outcomes, but not by much. 0 shows the lowest number of Indians killed in Ambrose as 691 and the highest as 814, a range of 123. In the adjusted table, this span is reduced to 113 with a low of 636 and a high of 749. For Fox, the average is lowered by nine casualties and the range between the highest and lowest is only reduced from 138 to 134. The change is least for Gray, with the average number of Indian casualties only reduced by one and the range from

highest to lowest only reduced by two. It is also interesting to note that this range in outcomes is largest in Gray with a low of 71 Indians killed and a high of 279 in the adjusted table.

## **C. CONCLUSIONS**

### **1. Outcomes of the Theories**

The output data we initially hoped to use to determine which of the three theories was most plausible were to be the number of Indians killed, duration of the engagement and the location of the casualties on the battlefield. Ambrose and Fox both give slightly different estimates of the number of casualties the Indians suffered. Fox is less precise in his estimate that the Indians sustained 30 to 100 casualties while Ambrose places his estimate right at 40. Gray makes no estimate of Indian casualties.

We decide to use the number 40 as our benchmark for two reasons. First, it is the most widely quoted number in the abundant literature on the subject. Two Indian accounts of the battle in National Park Service literature describing the battle place their number killed at about the same figure. An Indian named Low Dog stated 38 Indians were killed while Chief Gall stated 43 died in the battle (Utley). Additionally, it falls within the parameters of both authors who ventured an estimate. We expected the number of Indian casualties in the simulation to run a bit higher than what may have occurred during the actual battle. Although JCATS has input variables used to degrade marksmanship accuracy due to human factors, these factors can never be fully accounted for.

Although we expected a higher number of Indian casualties in the simulations than what actually occurred during the battle, the extraordinarily high number of Indians killed in Ambrose's theory of what occurred greatly exceed what plausibly could have occurred in all ten of the simulations ran. The lowest number of Indians killed was 636. This far exceeds Ambrose's own estimate of 40 Indians killed. All but three of the test runs for Fox's theory fall within the parameters of his estimate of 30 to 100 Indians killed. Gray made no estimate of the number of Indians killed, but the results from the test runs of Gray's theory averaged 153.8 Indians killed, with a high of 279. The lowest number killed while running Gray's scenario is 71, almost double the estimate from the



Indian accounts. Fox is obviously the clear winner in this category with three of the runs resulting in Indian casualties of 32, 36, 37, and 46; extremely close to the Indian accounts.

The three authors estimated that Custer's part of the battle lasted approximately one hour. Ambrose states less than an hour, Fox states about an hour, and Gray, with his detailed time analysis, estimated one hour and seven minutes. We set our benchmark at one hour. If one accepts the expectation that the Indians would suffer more casualties due to the inability of a computer program to properly compensate for all of the human factors that degrade marksmanship in combat, one should also reasonably expect that the duration of the engagement would be shorter in the simulation than in the actual battle. In all three scenarios, all iterations concluded in less than our benchmark of one hour. The duration of the Ambrose scenario was extremely consistent. Converting the decimal figures to minutes and seconds, one sees that all ten iterations ended at between 27:11 and 27:30, a span of only 19 seconds. Gray is slightly less consistent with a range across all ten iterations of only 1 minute and 43 seconds ranging from 36:16 to 37:59 when converted. Fox has a range 1 minute and 48 seconds for nine of the iterations ranging from 27:52 to 29:40 when converted to minutes and seconds. Run number six as shown in 0 is an outlier where the battle lasted 44 minutes and 17 seconds. Time wise, this outlier comes closest to our benchmark of one hour than any of the other iterations ran. What makes this even more remarkable is the fact that number of Indian casualties in this iteration was 36. Only one other iteration was closer to our benchmark of 40, run number three of Fox with an Indian casualty count of 37.

The cavalry casualties in this same iteration, number six of Gray, also seemed to resemble the layout of the grave markers on the actual battlefield quite well. Unfortunately, JCATS does not have the ability to capture screenshots. This is one of the reasons we eventually decided to forego using the final layout of the dead cavalry troopers as one of our criteria. All three scenarios resulted in the casualties being spread out in the close proximity to the pattern we expected to see. Although some looked closer than other, the results would simply be too subjective without a detailed analysis of the precise location of the dead soldiers in the simulation with respect to the location of

the actual grave markers on the battlefield. Fox includes a very detailed map with the location of the grave markers and the artifacts he found in the back of a book he coauthored with Douglas D. Scott detailing the archaeological work they conducted in 1984. Unfortunately, this map bears no grid coordinates or reference points of any kind. This was most likely a conscious omission designed to prevent unauthorized persons from scavenging the sites. However, it also precludes us from using it for comparison against the results of our simulations.

Given the results of the simulations we ran, the results of the Fox theory seemed to most closely resemble the results of the actual battle. Although the average duration of the battle was only half that of our one hour benchmark, the average number of Indian casualties came the closest to our benchmark of forty with four of the ten iterations coming remarkably close to matching that of the actual outcome. Also, as mentioned before, one of those four iterations was the outlier with a duration of 44 minutes and seventeen seconds, the closest any of the runs came to matching the estimated one hour of the actual battle. Gray's theory came in a close second. With an average duration of 37 minutes and 9 seconds, it came closest to matching the actual results in the category of time. However, its average of 154 Indian casualties was nearly four times the number of those estimated to have been killed in the actual battle. Ambrose's theory, while very close to the other two in duration, simply incurred far too many Indian casualties to even be considered. It is interesting to note that these findings coincide perfectly with those of LT Burns in his original thesis, whose work led to this study.

## **2. JCATS as a Tool**

As stated in the beginning, our primary purpose for this work was to carry on the work of Lieutenant Burns and attempt to determine which of these three theories was most plausible. However, we also hoped that our work would shed some light on the feasibility of using combat modeling to conduct After Action Reviews (AARs) of past battles where individual variable could be tweaked to see how they would have impacted the outcome.

Our first observation is that this will work best for battles where more details of what occurred are known. JCATS usefulness as a tool to extrapolate unknown facts is

limited, especially in cases like the Battle of Little Bighorn, where the few recorded facts available are far outweighed by what is unknown. Second, anyone using JCATS to prepare for real life missions should be made aware that the default ballistics data for pre-programmed weapons systems in the database are not based on any scientific calculations. In fact, some of the default settings defy common sense by giving a shooter a better chance of hitting a target that is moving than one that is stationary. Finally, the best thing about JCATS, its ability to let the user model individual combatants in detail, is also one of its greatest liabilities when used for modeling past battles, especially large scale engagements. It is very difficult to program the movements of large numbers of individuals, and nearly impossible when that movement depends upon the action of the opposing force.

This is not a factor when using JCATS on a network with live individuals sitting at stations who are able to input actions based upon what the enemy and other friendly forces are currently doing. However, it is a factor when programming a scenario to run multiple iterations for statistical analysis. The action an individual soldier may take when the buddies on his left and right are performing optimally may be distinctly different from that taken when the buddies on his left and right have been wounded or killed, or at least it should be. Unfortunately, these differences in behavior are difficult to model with any degree of accuracy without a live person monitoring the action and inputting commands as the situation evolves. Even with this being the case, it is imperative that the different actions a soldier may take be programmed into the scenario for the sake of consistency. While running multiple iterations run with live people setting at the controls influencing the events of the battle may be easier to program and allow for a wider range of options in the behavior of the modeled combatants, one would have to be suspicious of the results of any data obtained. It may sound counterintuitive that a human being at the controls should not be used to replicate the human variable factor, but if we are to isolate one variable for analysis, the other variables must be able to be made consistent over multiple iterations. If this were not the case, who would be able to say that the results of any one battle was not due to an operator at a terminal turning around to ask someone to get him a cup of coffee at a critical juncture in the battle?

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## IV. RECOMMENDATIONS FOR FUTURE RESEARCH

Although some of our work was limited due to the capabilities of JCATS, much more of it was limited by time. There are many things that we would have liked to have done, or done again differently, if we had had more time. Some of the things are minor, such as adding the battalion surgeon and four civilians to bring the total of Custer's force to 210, instead of 205. Also, if we had it to do over again, we would space out Indian a bit more. They tended to clustered together quite a bit in our simulations, especially when grouping formations overlapped. Additionally, although we initially tried to incorporate the horses into the scenarios by modifying the maneuver ability and load capacity of a truck, we soon abandoned this approach due to the complexities it introduced. This is a detail more suited to an individual with more time and expertise than either one of the authors of this thesis were able to bring to bear on the problem. However, these are all merely refinements to the setup.

The most interesting potential for future work lies in experimenting with the "what if" scenarios. What if Custer had taken the two extra companies he was offered with him? What if Custer had taken the Gatlin guns? What if he had not split his forces up? Changing variable such as these are where the real benefits of computer combat modeling come into play. It permits a person to change only one aspect of a battle to see what effect that one variable may have on the outcome.

There are many who would consider contemplating the various "what if" scenarios as a waste of time due to the difficulty in isolating just one variable. Take the Gatlin guns for instance. If Custer had taken them, they would have slowed him down. In fact, this is the very reason that he did not take them. One could argue that experimenting with what may have occurred if he had had them with him is a moot point because if he had taken them, he never would have arrive there in time to catch the Indians. Also, the Indians very like would not have fought so aggressively when faced with the additional firepower. These are valid arguments, but they miss the point. The point is not to merely see how things may have turned out differently in this particular

instance, but to see the effect that variable has so that it's value may be assessed in future operations. While we are well aware that Gatlin guns are no longer part of the current unit equipment, the same issues may be a consideration when a patrol leader is trying to decide whether or not to take the platoon M-60 machine guns on a particular mission. Unfortunately, we were unable experiment with any of the "what if" scenarios we considered due to the time consumed by the numerous technical difficulties we encountered.

Also in hindsight, we feel it may have been better to replace Ambrose's theory with that of Gregory F. Michno's in his book titled "Lakota Noon". His book is based primarily on details taken from Indian accounts of the battle. It includes very detailed maps of his version of events depicting the action in fifteen minute increments.

## APPENDIX A. WEAPONS DATA

### A. CAVALRY WEAPONS

The first thing that needed to be determined was the number of combatants on each side and the types of weapons they used. For the 7<sup>th</sup> Cavalry, this task was relatively easy. Custer's force of five companies consisted of 206 soldiers and 4 civilians. The standard weapons of issue for each soldier were the Model 1873 Springfield "Trapdoor" Carbine and the Model 1873 Colt Single Action Army (SSA) revolver. There were a few notable exceptions such as Remington .50 caliber sporting rifle and pair of Webley British Bulldog revolvers said to be carried by Custer or the .50 caliber Springfield rifle carried by Captain Thomas French of M Company, but these were rare exceptions and were not modeled into the JCATS database (Shulman, 1998).

"Going into battle on June 25, each man was supposed to have one hundred rounds of carbine ammunition and twenty-four pistol cartridges (counting six in the revolver) divided between his person and his saddle bags" (Hutchins, 1976, p. 30). This data was entered into JCATS as were the reload rates. For the carbine, John S. Du Mont's book titled *Custer Battle Guns* gives a rate of fire of twelve to thirteen rounds per minute. Testing conducted by the Army in 1879 gave a rate of fire of 29 shots in two minutes, or 14.5 shots per minute (Ordnance Notes No. 115). However, this was on a sterile firing range with none of the distractions of combat. We decided the lower rate of twelve rounds per minute to be more appropriate for the simulation. This divides out to a six second reload time.

We were unable to obtain data for the reload time of the revolver. However, the 1873 Colt SAA was not designed for fast reloading. The Army wanted the sturdiness of a solid frame. This meant that instead of breaking open for reloading, the Colt SAA was reloaded from a swing out gate on the right side of the cylinder. Each expended round had to be manually extracted prior to inserting a fresh round. With practice, the process could probably be accomplished in about thirty seconds. An article by James S. Hutchins titled "Captain Michaelis Reports on Army Weapons and Equipment on the Northern

Plains, 1876-1879” is a compilation of reports given by Captain Otho Ernest Michaelis, the Chief Ordnance Officer for the Military Department of Dakota. An 1877 report by Captain Michaelis seems to indicate that the reload time of the revolver was of little concern to the soldiers who carried them. He wrote:

This arm is the weapon of an *instant*; the question of extraction and reloading does not, in my opinion, enter in any way into the problem....After the weapon has exhausted its resources, it is a matter of small concern to the hard-pressed soldier, whether it will take him thirty or sixty seconds to reload. He is lost in any event, and his final effort will be made in hurling his pistol at the head of his nearest foe.

This quote is taken from a part of the report when Captain Michaelis is defending the Colts as more reliable weapons than the Schofield Smith and Wesson revolvers whose “only claim to superiority over the Colt’s is founded upon their capability of automatic extraction” (Hutchins, 1998). This would seem to indicate that the thirty versus sixty second reload times he refers to is a comparison between the Schofield Smith and Wesson and the Colt SAA with the Colt SAA having a reload time of about sixty seconds. Although both authors are experienced pistol marksmen, lacking any specific experience with the Colt SAA, we decided to defer to Captain Michaelis’ estimate, even if made offhandedly, and program a reload time of sixty seconds for the revolver.

## **B. INDIAN WEAPONS**

Unlike the cavalry, the Indians had no Ordnance Corp and were not equipped with any standard type of firearm. Instead, they utilized a wide variety of weaponry. How many different types of weapons were used? Fox’s study found bullets or weapons fragments from 23 different types of firearms in addition to the Springfield carbine and Colt revolver used by the Army (1987, p. 109). Fox went on to compare these findings to the types of weapons identified in an earlier study by former battlefield historian B. William Henry. Henry’s study had identified 13 different types of firearm. Fox found that 10 of the 13 were the same as those that he had found. However, Henry’s had also found evidence of 3 types of firearms that Fox had not discovered. Adding these 3 to



Fox's 25 brings the total number of known firearms types to 28, including the Army weapons. Fox also found eight arrowheads and a fragment from a ninth corroborating historical accounts that many of the Indians were armed with bows and arrows.

After identifying as accurately as possible the types of weapons used, Fox went on to examine each bullet and cartridge case in excruciating detail in an effort to try to identify the number of different weapons of each type. By examining the firing pin and extractor marks on the shell casings, Fox was able to identify 69 different Model 1873 Springfield carbines used in the battle accounting for almost a third of Custer's forces. As for the Indian weapons, Fox found evidence of 119 different firearms. The most common was the .44 rimfire fired by the Model 1866 Winchester and Henry repeating rifles. He found evidence of 55 individual weapons of this type. Next came the .50/70 caliber round fired by the Sharps and Springfield rifles. There were 30 individual weapons of this type accounted for, 25 Sharps and 5 Springfields. The third most common was another Winchester repeating rifle, the .44/40 round fired by the Model 1873, with 7 individual weapons identified. These three categories accounted for 92 of the 119 distinctly different weapons identified.

Fox then attempted to extrapolate the total of number of Indian weapons present at the battle by a statistical comparison. He reasoned that if evidence of 69 (32.2%) of the 210 Army weapons known to be present at the battle was found, then it stood to reason that evidence of the 119 Indian weapons found should only account for about 32.2% of the Indian weapons present at the battle. This calculates out to an estimate of 370 Indian firearms. Their 32.2% figure also coincides with the results of an experiment they conducted to test the representative sample size of artifacts they had collected. They did this by selecting three 100 square meter areas of the battlefield that had already been searched and conducted a second systematic and much more thorough search of these three areas. For their sample they selected one area where a large number of artifacts had been discovered, one where very few had been discovered, and one where they had obtained average results. They found that their second search led to the discovery of about twice as many items as the first search. This would seem to indicate that their search probably only discovered about one third of the artifacts there were to be found.

Fox and Scott then point out that the 370 figure is a conservative estimate for two reasons. First, most of the rounds from muzzle-loaded weapons could not be identified as coming from individual weapons because they did not use metallic cartridge cases which could be examined for distinct firing pin and extractor markings. Therefore many rounds attributed to only one individual weapon in all likelihood came from several different weapons of the same type. If these rounds could have been further differentiated, it would have significantly increased the number of individual weapons identified. Second, although all the positions of Custer's men were within the area that Fox's team examined, many of the positions that the Indians fired from lie outside the boundaries of that area. Taking these two factors into account leads to the conclusion that the number of Indian firearms present was much higher than 370.

Although there are several different estimates from survivors of the Reno-Bentley portion of the battle as to the number of Indian warriors present that day, ranging from 1500 up to 9000, only one addresses the breakdown of how the Indians were armed. Scott and Fox quote Charles Windolph of Company H as estimating "that fully half the warriors carried only bows and arrows and lances, and that possibly half the remainder carried odds and ends of old muzzle-loaders and single shot rifles of various vintages. Probably not more than 25 or 30 percent of the warriors carried modern repeating rifles" (1987, p. 112). In another article Scott wrote with Melissa A. Connor titled "Post-mortem at the Little Bighorn", Scott obviously combines the results of the archeological study with Windolph's estimate. He speculates

that if 1,500 Indian warriors took part in the battle..., then about 375 would have been armed with muzzle-loaders and single-shot rifles such as Sharps and Ballards, and about 192 would have been armed with repeating weapons. The rest may have used bows and arrows and a few old pistols and revolvers.

While we have attempted to be as precise as possible, we must acknowledge that there are several considerations that we have purposely omitted. For example, the 32.2 percent figure Scott and Fox arrive at by dividing the 69 Model 1873 Springfield carbines they found evidence of by the 210 soldiers known to have died in the battle fails to take into account the fact that not all 210 of those soldiers carried that weapon. As stated

earlier, there were a few exceptions. Nor does it account for the fact that some of the 69 individual weapons of this type identified may have been Indian weapons captured from General Crook's forces at the Battle of Rosebud eight days earlier. The bottom line is that although we have attempted to be precise in our calculations, the results can only be as precise as the data entered into the simulation.

### **C. BALLISTICS DATA AND COMPUTATIONS**

The data that required the most time for calculation was that of each weapon's accuracy. Unfortunately, the curator of arms at the West Point museum was reluctant to let us take any of the historical weapons they have on display there out to firing range to conduct our research. He was, however, very helpful in pointing us to relevant information sources. The most useful was a copy of *Ordnance Notes No. 115*. It was a report published by the Ordnance Office of the War Department in 1879 comparing the accuracy of captured Indian weapons and those of the U.S. Army. Two captured Sharps .44 caliber rifles were tested against a Springfield rifle and a captured Winchester repeating rifle was compared against the Springfield carbine. The Winchester and Springfield carbine were fired at targets 300 and 600 yards away. The two Sharps and Springfield rifle were fired at targets located 500, 800, and 1000 yards away. The mean horizontal and vertical deviation for each weapon at each range was recorded. This data was used to calculate the probability of each weapon hitting a man-sized target at each of the different ranges. The standard target chosen to represent this was the "Iron Maiden" which is very similar in appearance to the "E" type silhouette used by the U.S. military in marksmanship training. The dimensions for this target are given in Figure 5.

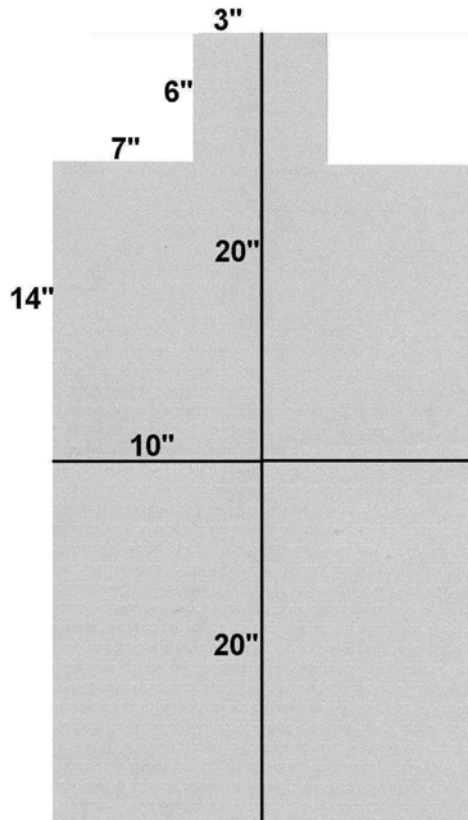


Figure 5. "Iron Maiden" Target

Next, a template was created to calculate the probability of each weapon's ability to hit a target of a given size at various ranges using the mean horizontal and vertical deviation numbers obtained from the weapons testing conducted in 1879 and documented in *Ordnance Notes No. 115*. The template was created using a variation of standard deviation called "probable error". "A probable error (abbreviated PE) may be defined as a distance such that exactly 50 percent of the rounds fall within the interval  $[-PE, PE]$ " (Mansager, Probable Error Class Notes). This means that for a given weapon aimed at a fixed point, the PE is the distance from that fixed point, either horizontally or vertically, that 50 percent of the shots would be expected to fall within. Figure 6 illustrates horizontal probable error. For a properly sighted weapon aimed at the fixed point at the

center of the target, 25 percent of the shots fired would be expected to hit within one probable error to the left of center between lines A and B and 25 percent would be expected to hit within one probable error to the right of center between lines B and C.

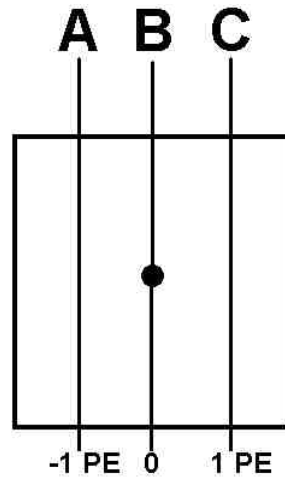


Figure 6. Horizontal Probable Error

Of the remaining 50 percent, 25 percent would be expected to hit left of line A and the other 25 percent to the left of line C. They are uniformly distributed in the shape of a bell curve and can be further sub-divided so that practically 100 percent of the shots are accounted for within four probable errors on either side of the point of aim as shown in Figure 7.

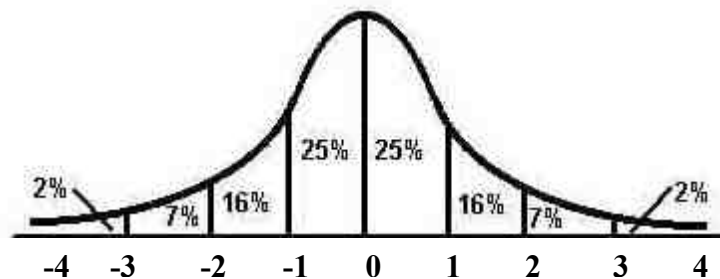


Figure 7. Bell Curve Distribution

The same pattern of distribution occurs vertically as well, although the distance that is represented by each vertical PE may or may not be equal to the distance represented by each horizontal PE. Although the distribution within a PE region is not uniformly distributed, it is standard practice to alter the shape of the bell curve to the bar graph represented in Figure 8. This sacrifices a small degree of accuracy for ease of calculation. Next, by combining the horizontal and vertical PE into one graph, the matrix in Figure 9 is obtained. The PE within each square is calculated by multiplying the horizontal and vertical PE at that intersection point. Next, by adjusting the matrix for each weapon so that one horizontal PE is equal to the mean horizontal deviation at a given range, and one vertical PE is equal to the mean vertical deviation at that same given range, the matrix can then be superimposed on the “Iron Maiden” target to calculate the weapon’s probability of a achieving a hit at that range.

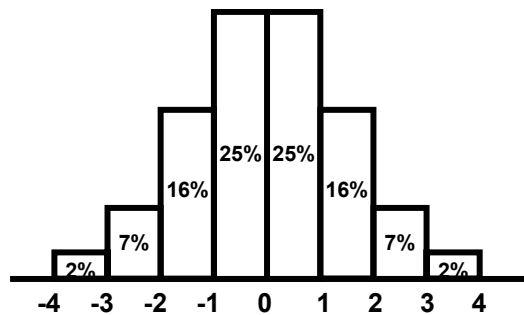


Figure 8. Bell Curve Converted to Uniform Distributions within a PE Region

|           |           |           |           |            |            |            |            |           |           |            |
|-----------|-----------|-----------|-----------|------------|------------|------------|------------|-----------|-----------|------------|
|           |           | <b>2%</b> | <b>7%</b> | <b>16%</b> | <b>25%</b> | <b>25%</b> | <b>16%</b> | <b>7%</b> | <b>2%</b> |            |
| <b>4</b>  |           | .04%      | .14%      | .32%       | .5%        | .5%        | .32%       | .14%      | .04%      | <b>2%</b>  |
| <b>3</b>  |           | .14%      | .49%      | 1.12%      | 1.75%      | 1.75%      | 1.12%      | .49%      | .14%      | <b>7%</b>  |
| <b>2</b>  |           | .32%      | 1.12%     | 2.56%      | 4%         | 4%         | 2.56%      | 1.12%     | .32%      | <b>16%</b> |
| <b>1</b>  |           | .5%       | 1.75%     | 4%         | 6.25%      | 6.25%      | 4%         | 1.75%     | .5%       | <b>25%</b> |
| <b>0</b>  |           | .5%       | 1.75%     | 4%         | 6.25%      | 6.25%      | 4%         | 1.75%     | .5%       | <b>25%</b> |
| <b>-1</b> |           | .32%      | 1.12%     | 2.56%      | 4%         | 4%         | 2.56%      | 1.12%     | .32%      | <b>16%</b> |
| <b>-2</b> |           | .14%      | .49%      | 1.12%      | 1.75%      | 1.75%      | 1.12%      | .49%      | .14%      | <b>7%</b>  |
| <b>-3</b> |           | .04%      | .14%      | .32%       | .5%        | .5%        | .32%       | .14%      | .04%      | <b>2%</b>  |
| <b>-4</b> |           |           |           |            |            |            |            |           |           |            |
|           | <b>-4</b> | <b>-3</b> | <b>-2</b> | <b>-1</b>  | <b>0</b>   | <b>1</b>   | <b>2</b>   | <b>3</b>  | <b>4</b>  |            |

Figure 9. Probable Error Matrix

Figure 10 illustrates the PE matrix for the Model 1873 Springfield “Trapdoor” Carbine superimposed on an “Iron Maiden” target at a range of 300 yards. The matrix is rectangular because the horizontal deviation is greater than the vertical deviation. Each of the red rectangles measure 5.5”, the mean horizontal deviation, by 2.3”, the mean vertical deviation. One can calculate the probability of hitting (PH) a target of this size at this range merely by adding up the percentages in the corresponding rectangles on the target. Rectangles not completely on the target are calculated by interpolating how much of their area is covered within the target area and the corresponding probabilities. However, because in this case the maximum vertical deviation does not exceed the target size, the PH can be calculated using only the horizontal deviation. Also, because the target is symmetrical, the values can be calculated for just one half of the target and then multiplied by two. The two horizontal column from 0 to 1PE is completely contained within the target and accounts for 25% of the shots fired. The next column, 1PE to 2PE accounts for 16% of the shots fired. However, not the entire column is within the target area. Only 4.5” of the 5.5” are on the target. One must first divide 4.5 by 5.5 to get .818,

and then multiply 16% by .818 to calculate 13.09% of this second column covering the target. Adding this to the first column's 25% totals 38.09% of the hits occurring on one half of the target. If one multiplies this number by two to account for both halves of the target, it yields 76.18% for the probability of the Model 1873 Springfield "Trapdoor" Carbine hitting a target with the dimensions of "Iron Maiden" target at a range of 300 yards.

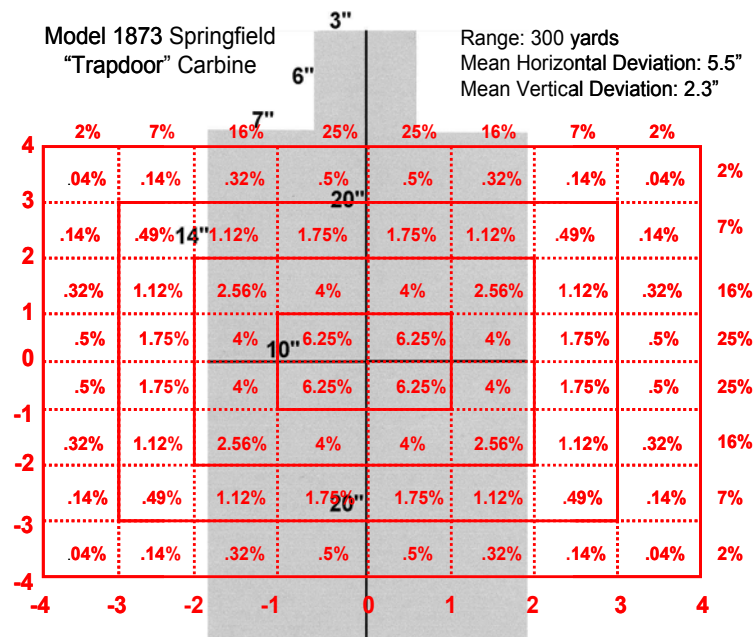


Figure 10. PE matrix Superimposed on 300 Yard "Iron Maiden" Target

Increasing the range to 600 yards increases the size of each rectangle which makes the target appear smaller when compared to the PE matrix. With the size of each rectangle increased to a width of 15.5", the mean horizontal deviation at 600 yards, and a height of 7.3", the mean vertical deviation at 600 yards, none of the rectangles fall completely within the target. They must be calculated as a percentage of the total area. The PH for the Model 1873 Springfield "Trapdoor" Carbine at 600 yards works out to be 28.32% as illustrated in Figure 11.



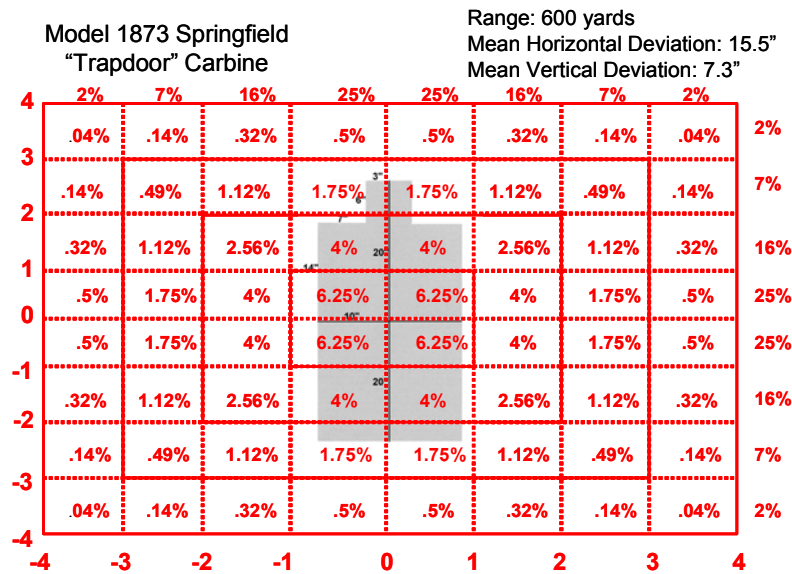


Figure 11. PE Matrix Superimposed on 600 Yard "Iron Maiden" Target

The same steps were also taken for each of the three Indian weapons listed in *Ordnance Notes No. 115*. These consisted of one Winchester and two Sharp's rifles. The Winchester was the .44 caliber Model 1866 repeating rifle and it was compared to the 1873 Springfield carbine for accuracy. The Sharp's rifles were .44 caliber breech-loaders and these were compared to the 1873 Springfield rifle for accuracy. The mean deviation data in Table 6 and Table 7 was taken from *Ordnance Notes No. 115*. The data in these tables was used to calculate the PH data for the "Iron Maiden" targets.

|                          | 300 Yards                 |                         |                         |                      |                              | 600 Yards                 |                         |                         |                      |                              |
|--------------------------|---------------------------|-------------------------|-------------------------|----------------------|------------------------------|---------------------------|-------------------------|-------------------------|----------------------|------------------------------|
|                          | Mean Horizontal Deviation | Mean Vertical Deviation | Mean Absolute Deviation | PH for "Iron Maiden" | PH for "Iron Maiden" (Prone) | Mean Horizontal Deviation | Mean Vertical Deviation | Mean Absolute Deviation | PH for "Iron Maiden" | PH for "Iron Maiden" (Prone) |
| 1873 Springfield Carbine | 5.5"                      | 2.3"                    | 6"                      | 76.18%               | 66.16%                       | 15.5"                     | 7.3"                    | 17.1"                   | 28.32%               | 14.36%                       |
| 1866 Winchester Rifle    | 7.1"                      | 5.2"                    | 8.8"                    | 61.08%               | 36.92%                       | 12.4"                     | 15"                     | 19.5"                   | 22.50%               | 7.26%                        |

Table 6. Winchester vs. Springfield Carbine

|                        | 300 Yards                 | 500 Yards                 |                         |                         |                      |                              | 800 Yards                 |                         |                         |                      |                              | 1000 Yards                |                         |                         |                      |                              |
|------------------------|---------------------------|---------------------------|-------------------------|-------------------------|----------------------|------------------------------|---------------------------|-------------------------|-------------------------|----------------------|------------------------------|---------------------------|-------------------------|-------------------------|----------------------|------------------------------|
|                        | Mean Horizontal Deviation | Mean Horizontal Deviation | Mean Vertical Deviation | Mean Absolute Deviation | PH for "Iron Maiden" | PH for "Iron Maiden" (Prone) | Mean Horizontal Deviation | Mean Vertical Deviation | Mean Absolute Deviation | PH for "Iron Maiden" | PH for "Iron Maiden" (Prone) | Mean Horizontal Deviation | Mean Vertical Deviation | Mean Absolute Deviation | PH for "Iron Maiden" | PH for "Iron Maiden" (Prone) |
| 1873 Springfield Rifle |                           | 5.3"                      | 9.4"                    | 10.8"                   | 61.14%               | 29.52%                       | 13.2"                     | 15.5"                   | 20.3"                   | 20.56%               | 8.44%                        | 6.3"                      | 19.3"                   | 20.4"                   | 31.84%               | 14.20%                       |
| Sharp's Rifle No. 1    |                           | 10.7"                     | 8.8"                    | 13.9"                   | 37.34%               | 18.20%                       | 18.5"                     | 27.8"                   | 33.4"                   | 8.70%                | 3.34%                        | 22.3"                     | 7.7"                    | 23.6"                   | 19.14%               | 9.60%                        |
| Sharp's Rifle No. 2    |                           | 9.9"                      | 10.2"                   | 14.2"                   | 37.30%               | 17.02%                       | 39.2"                     | 8.5"                    | 40.1"                   | 10.36%               | 5.08%                        | 14.3"                     | 30.2"                   | 33.4"                   | 10.36%               | 3.12%                        |

Table 7. Sharp's vs. Springfield Rifle

The data for the prone "Iron Maiden" target shown in Figure 12 was calculated in the same manner using a shorter version of the target to simulate a person lying in the prone position. All dimensions were the same except for the overall height which was reduced from 40 inches to 18 inches. A higher PH may have been obtained by using a lower point of aim as center mass. However, as it turned out, the calculations for a prone target were not required. JCATS has a setting that allows the user to input the size of a target in both the prone and standing position which negates the need for a separate PH ratio. This calculation is listed in Tables 2 and 3 solely for the purpose of comparison. The most interesting thing to note is that the difference in the accuracy of the Springfield carbine and the Winchester rifle becomes much more dramatic when firing at a prone target.

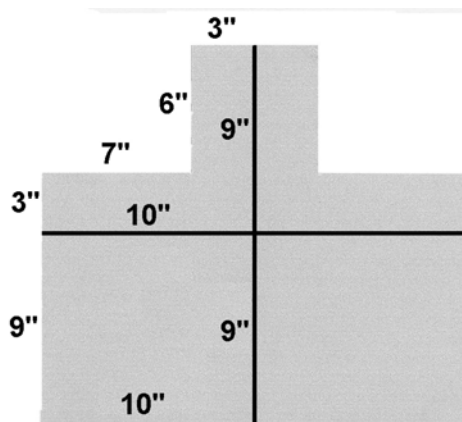


Figure 12. "Iron Maiden" Target (Prone)

Overall, we were quite confident in the reliability of our data as far as the ballistics characteristics of the weapons systems by themselves were concerned. We were not quite as confident when it came to calculating other factors such as degradation of accuracy due to engaging moving targets or while moving one's self. This is due to a serious lack of hard data on the subject. The default JCATS values are not based on any scientific research and have not even been scrubbed to check for relative consistency, as in the example noted earlier where some weapon systems are assigned a higher probability of hitting a target that is moving than one that is stationary. Even the U.S. Army Marksmanship Unit and the staff at the moving target range facility at Fort Benning were unable to provide the needed data. This is a shortcoming that needs to be addressed if one hopes to achieve credible results from combat modeling programs such as JCATS.

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## APPENDIX B. JCATS INPUT VARIABLES

We ran our simulations utilizing the Joint Conflict and Tactical Simulation (JCATS Version 4.1.0) software on a Linux 7.3 Operating System powered by a Pentium 4, 2.53 GHz computer with 754mb of Random Access Memory. The following are the parameters and settings used for our simulations. Each of the simulations contains the same base information pertaining to Task Organization, Systems, Weapons, Munitions, and PH/PK tables. Theory specific information such as TF location and direction of attack is listed at the end of this annex.

### A. TASK ORGANIZATION

Our task organization is based on 1500 Indian warriors with a weapon cross distribution based on the archeological data discovered by Richard Fox. Since there are no records indicating where each warrior was located on the battlefield and the Indian forces were not organized by weapon type we decided to develop equal sized task forces for control purposes. We started with the following distribution listed in Table 9 below as per the archeological information and then divided the numbers into 24 groups. Each of the rifle types were divided into 12 Indian groups and the Bow and Arrow warriors were divided into 12 Indian B&A groups.

| Weapon                   | Magazine Capacity | Muzzle Velocity | Max Effective Range | Number of Indians |
|--------------------------|-------------------|-----------------|---------------------|-------------------|
| 1860 Henry               | 15                | 1167            | 250 yards           | 100               |
| 1866 Winchester          | 15                | 1167            | 250 yards           | 100               |
| 1873 Winchester          | 15                | 1310            | 450 yards           | 25                |
| Sharps .50 cal           | 1                 | 1375            | 500 yards           | 80                |
| Springfield .50 cal      | 1                 | 1345            | 500 yards           | 15                |
| Rifled Muzzleloader      | 1                 | 1375            | 500 yards           | 140               |
| Smooth Bore Muzzleloader | 1                 | 1375            | 100 yards           | 140               |
| Bow and Arrow            | 1                 |                 | 30 yards            | 850               |
| 1873 Springfield         | 1                 | 1126            | 500 yards           | 50                |

Table 8. Indian Distribution

**1. Indians (Red)**

INDIANS TF1

1/Indians  
1/B&A/Indians  
11/Indians  
11/B&A/Indians

INDIANS TF2

2/Indians  
2/B&A/Indians  
12/Indians  
12/B&A/Indians

INDIANS TF3

3/Indians  
3/B&A/Indians

INDIANS TF4

4/Indians  
4/B&A/Indians

INDIANS TF5

5/Indians  
5/B&A/Indians

INDIANS TF6

6/Indians  
6/B&A/Indians

INDIANS TF7

7/Indians  
7/B&A/Indians

INDIANS TF8

8/Indians  
8/B&A/Indians

INDIANS TF9

9/Indians  
9/B&A/Indians

INDIANS TF10

10/Indians  
10/B&A/Indians

## **2. Cavalry (Blue)**

### **CAVALRY TF1**

HQ/7<sup>th</sup> Cavalry - 5 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

### **CAVALRY TF2**

1/C/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

2/C/7<sup>th</sup> Cavalry - 14 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

3/C/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

### **CAVALRY TF3**

1/E/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

2/E/7<sup>th</sup> Cavalry - 14 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

3/E/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

### **CAVALRY TF4**

1/F/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

2/F/7<sup>th</sup> Cavalry - 14 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

3/F/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

### **CAVALRY TF5**

1/I/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

2/I/7<sup>th</sup> Cavalry - 14 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

3/I/7<sup>th</sup> Cavalry - 12 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

### **CAVALRY TF6**

1/L/7<sup>th</sup> Cavalry - 16 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

2/L/7<sup>th</sup> Cavalry - 16 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

3/L/7<sup>th</sup> Cavalry - 16 x Cavalry with Springfield 1873 Trapdoor  
& Colt 1873 Revolver

**B. PROBABILITY OF HIT (PH) AND PROBABILITY OF KILL (PK) TABLES**

**1. Probability of Hit Tables**

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 23        | 75   | 65   | 55   | 20   |
| 46        | 50   | 40   | 30   | 10   |
| 92        | 0    | 0    | 0    | 0    |

Table 9. Bow and Arrow

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 23        | 75   | 65   | 55   | 20   |
| 46        | 50   | 40   | 30   | 10   |
| 92        | 0    | 0    | 0    | 0    |

Table 10. Colt 1873 Revolver

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 80   | 40   | 30   | 20   |
| 125       | 70   | 27   | 17   | 0    |
| 185       | 58   | 19   | 0    | 0    |
| 275       | 40   | 0    | 0    | 0    |
| 550       | 0    | 0    | 0    | 0    |

Table 11. Henry 1860

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 87   | 44   | 34   | 20   |
| 125       | 82   | 32   | 22   | 0    |
| 185       | 75   | 24   | 0    | 0    |
| 275       | 66   | 0    | 0    | 0    |
| 455       | 37   | 0    | 0    | 0    |
| 730       | 10   | 0    | 0    | 0    |
| 910       | 0    | 0    | 0    | 0    |

Table 12. Rifled Muzzleloader



| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 79   | 40   | 30   | 20   |
| 92        | 75   | 33   | 23   | 0    |
| 125       | 66   | 19   | 9    | 0    |
| 185       | 50   | 16   | 0    | 0    |
| 275       | 0    | 0    | 0    | 0    |

Table 13. Smooth Bore Muzzleloader

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 87   | 44   | 34   | 20   |
| 125       | 82   | 32   | 22   | 0    |
| 185       | 75   | 24   | 0    | 0    |
| 275       | 66   | 0    | 0    | 0    |
| 455       | 37   | 0    | 0    | 0    |
| 730       | 10   | 0    | 0    | 0    |
| 910       | 0    | 0    | 0    | 0    |

Table 14. Sharps .50 Cal

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 87   | 44   | 34   | 20   |
| 125       | 82   | 32   | 22   | 0    |
| 185       | 75   | 24   | 0    | 0    |
| 275       | 66   | 0    | 0    | 0    |
| 455       | 37   | 0    | 0    | 0    |
| 730       | 10   | 0    | 0    | 0    |
| 910       | 0    | 0    | 0    | 0    |

Table 15. Springfield .50 Cal

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 90   | 45   | 35   | 20   |
| 125       | 88   | 34   | 24   | 0    |
| 185       | 82   | 26   | 0    | 0    |
| 275       | 76   | 0    | 0    | 0    |
| 550       | 28   | 0    | 0    | 0    |
| 700       | 0    | 0    | 0    | 0    |

Table 16. Springfield 1873 Trapdoor

| Range (m) | SSEF | SMEF | MSEF | MMEF |
|-----------|------|------|------|------|
| 0         | 95   | 85   | 75   | 40   |
| 75        | 86   | 43   | 33   | 20   |
| 125       | 80   | 31   | 21   | 0    |
| 185       | 72   | 23   | 0    | 0    |
| 275       | 61   | 0    | 0    | 0    |
| 550       | 22   | 0    | 0    | 0    |
| 700       | 0    | 0    | 0    | 0    |

Table 17. Winchester 1866

## 2. Probability of Kill Table

All of the weapon systems use the same PK Table as they are similar in capability. Each of the categories is by design the same value. We controlled the ratio by weighting the values of probability in the direct fire section of the Parameters section in the Vista editor.

| Range (m) | MOBEF | FRPEF | MOFEF | KKEF |
|-----------|-------|-------|-------|------|
| 0         | 95    | 95    | 95    | 95   |
| 100       | 85    | 85    | 85    | 85   |
| 200       | 75    | 75    | 75    | 75   |
| 300       | 65    | 65    | 65    | 65   |
| 400       | 55    | 55    | 55    | 55   |

Table 18. All Weapons

### C. SYSTEM SPECIFIC DATA

#### Defilade Exposure

Partial Defilade 0.5 meters

Full Defilade 0.1 meters

|         | Weapon              | Munitions           | # of Rounds |
|---------|---------------------|---------------------|-------------|
| Cavalry |                     |                     |             |
|         | Springfield 1873    | Springfield .45 Cal | 100         |
|         | Colt 1873           | Colt 1873           | 12          |
| Indians |                     |                     |             |
|         | Winchester 1873     | Winchester 1873     | 30          |
|         | Springfield .50 Cal | Springfield .50 Cal | 30          |
|         | Henry .44 Cal       | Henry .44 Cal       | 30          |
|         | Rifled Muzzleloader | Springfield .50 Cal | 30          |
|         | Sharps .50 Cal      | Springfield .50 Cal | 30          |
|         | Smooth Bore Muzzle  | Springfield .50 Cal | 25          |
|         | Springfield 1873    | Springfield .45 Cal | 30          |
|         | Winchester 1866     | Winchester .44 RF   | 30          |

Table 19. Stations (Weapon Assignment and Ammunition)

#### Casualty Play

Damage Class: Troop

Medical Capability: None

#### Soldier Characteristics

Weight: 185 lbs.

Volume (m<sup>3</sup>): 1

Peripheral Acquisition: 100%

#### Fatigue Parameters

Class Name: Normal Trained (for all Cavalry)

Ill Trained (for all Indians)

Energy Level: Maximum Calories 3000

Initial % of Max: 61

|                      | Prone | Crouching | Standing |
|----------------------|-------|-----------|----------|
| Silhouette (m2)      | 0.25  | 0.8       | 1.8      |
| Height (m)           | 0.25  | 0.8       | 1.75     |
| Slow Speed (km/hr)   | 1     | 3         | 5        |
| Medium Speed (km/hr) | 1.5   | 4         | 6.5      |
| Fast Speed (km/hr)   | 1.7   | 5         | 9        |
| Max Speed (km/hr)    | 2     | 6         | 12       |

Table 20. Posture Table

**D. THEORY SPECIFIC INFORMATION (INITIAL LOCATIONS)**

| Unit           | Location             | Orientation<br>in degrees | Line of Sight<br>in Degrees |
|----------------|----------------------|---------------------------|-----------------------------|
| 1/Indians      | 45:34:39N/107:24:51W | 118                       | 360                         |
| 1/B&A/Indians  | 45:34:39N/107:24:51W | 121                       | 360                         |
| 2/Indians      | 45:34:40N/107:24:50W | 136                       | 360                         |
| 2/B&A/Indians  | 45:34:40N/107:24:50W | 138                       | 360                         |
| 3/Indians      | 45:34:38N/107:24:51W | 101                       | 360                         |
| 3/B&A/Indians  | 45:34:38N/107:24:51W | 108                       | 360                         |
| 4/Indians      | 45:33:21N/107:24:01W | 42                        | 360                         |
| 4/B&A/Indians  | 45:33:19N/107:24:02W | 39                        | 360                         |
| 5/Indians      | 45:34:39N/107:24:48W | 138                       | 360                         |
| 5/B&A/Indians  | 45:34:39N/107:24:48W | 144                       | 360                         |
| 6/Indians      | 45:33:30N/107:24:02W | 349                       | 360                         |
| 6/B&A/Indians  | 45:33:29N/107:24:02W | 353                       | 360                         |
| 7/Indians      | 45:33:32N/107:24:09W | 44                        | 360                         |
| 7/B&A/Indians  | 45:33:31N/107:24:09W | 35                        | 360                         |
| 8/Indians      | 45:33:27N/107:24:01W | 43                        | 360                         |
| 8/B&A/Indians  | 45:33:25N/107:24:01W | 30                        | 360                         |
| 9/Indians      | 45:33:35N/107:24:10W | 44                        | 360                         |
| 9/B&A/Indians  | 45:33:34N/107:24:11W | 42                        | 360                         |
| 10/Indians     | 45:34:39N/107:24:47W | 163                       | 360                         |
| 10/B&A/Indians | 45:34:40N/107:24:47W | 168                       | 360                         |
| 11/Indians     | 45:34:38N/107:24:49W | 102                       | 360                         |
| 11/B&A/Indians | 45:34:38N/107:24:49W | 110                       | 360                         |
| 12/Indians     | 45:34:40N/107:24:48W | 160                       | 360                         |
| 12/B&A/Indians | 45:34:40N/107:24:48W | 161                       | 360                         |

Table 21. Ambrose Indians Initial Locations

| Unit                        | Location             | Orientation<br>in degrees | Line of Sight<br>in Degrees |
|-----------------------------|----------------------|---------------------------|-----------------------------|
| HQ/7 <sup>th</sup> Cavalry  | 45:33:39N/107:23:40W | 355                       | 360                         |
| 1/C/7 <sup>th</sup> Cavalry | 45:33:38N/107:23:38W | 338                       | 360                         |
| 2/C/7 <sup>th</sup> Cavalry | 45:33:39N/107:23:41W | 348                       | 360                         |
| 3/C/7 <sup>th</sup> Cavalry | 45:33:38N/107:23:37W | 308                       | 360                         |
| 1/E/7 <sup>th</sup> Cavalry | 45:33:36N/107:23:33W | 327                       | 360                         |
| 2/E/7 <sup>th</sup> Cavalry | 45:33:36N/107:23:34W | 329                       | 360                         |
| 3/E/7 <sup>th</sup> Cavalry | 45:33:37N/107:23:36W | 311                       | 360                         |
| 1/F/7 <sup>th</sup> Cavalry | 45:33:33N/107:23:29W | 322                       | 360                         |
| 2/F/7 <sup>th</sup> Cavalry | 45:33:35N/107:23:31W | 324                       | 360                         |
| 3/F/7 <sup>th</sup> Cavalry | 45:33:34N/107:23:30W | 323                       | 360                         |
| 1/I/7 <sup>th</sup> Cavalry | 45:33:30N/107:23:23W | 320                       | 360                         |
| 2/I/7 <sup>th</sup> Cavalry | 45:33:29N/107:23:22W | 320                       | 360                         |
| 3/I/7 <sup>th</sup> Cavalry | 45:33:28N/107:23:19W | 319                       | 360                         |
| 1/L/7 <sup>th</sup> Cavalry | 45:33:32N/107:23:26W | 320                       | 360                         |
| 2/L/7 <sup>th</sup> Cavalry | 45:33:31N/107:23:25W | 319                       | 360                         |
| 3/L/7 <sup>th</sup> Cavalry | 45:33:32N/107:23:27W | 321                       | 360                         |

Table 22. Ambrose Cavalry Initial Locations

| Unit           | Location             | Orientation<br>in Degrees | Line of Sight<br>in Degrees |
|----------------|----------------------|---------------------------|-----------------------------|
| 1/Indians      | 45:34:27N/107:24:27W | 219                       | 360                         |
| 1/B&A/Indians  | 45:34:26N/107:24:27W | 216                       | 360                         |
| 2/Indians      | 45:33:18N/107:25:25W | 74                        | 360                         |
| 2/B&A/Indians  | 45:34:40N/107:24:50W | 70                        | 360                         |
| 3/Indians      | 45:34:30N/107:25:28W | 131                       | 360                         |
| 3/B&A/Indians  | 45:33:27N/107:23:56W | 155                       | 360                         |
| 4/Indians      | 45:33:25N/107:23:57W | 54                        | 360                         |
| 4/B&A/Indians  | 45:33:19N/107:24:02W | 46                        | 360                         |
| 5/Indians      | 45:33:57N/107:22:51W | 256                       | 360                         |
| 5/B&A/Indians  | 45:33:58N/107:22:50W | 255                       | 360                         |
| 6/Indians      | 45:33:31N/107:24:03W | 353                       | 360                         |
| 6/B&A/Indians  | 45:33:29N/107:24:04W | 8                         | 360                         |
| 7/Indians      | 45:34:41N/107:24:51W | 109                       | 360                         |
| 7/B&A/Indians  | 45:34:35N/107:25:33W | 133                       | 360                         |
| 8/Indians      | 45:34:41N/107:24:51W | 140                       | 360                         |
| 8/B&A/Indians  | 45:34:32N/107:25:31W | 114                       | 360                         |
| 9/Indians      | 45:34:13N/107:23:07W | 255                       | 360                         |
| 9/B&A/Indians  | 45:33:49N/107:22:42W | 255                       | 360                         |
| 10/Indians     | 45:34:39N/107:24:47W | 274                       | 360                         |
| 10/B&A/Indians | 45:33:49N/107:22:40W | 274                       | 360                         |
| 11/Indians     | 45:34:39N/107:24:50W | 168                       | 360                         |
| 11/B&A/Indians | 45:34:29N/107:25:26W | 132                       | 360                         |
| 12/Indians     | 45:33:19N/107:25:24W | 79                        | 360                         |
| 12/B&A/Indians | 45:33:17N/107:25:25W | 67                        | 360                         |

Table 23. Fox Indians Initial Locations

| Unit                        | Location             | Orientation<br>in Degrees | Line of Sight<br>in Degrees |
|-----------------------------|----------------------|---------------------------|-----------------------------|
| HQ/7 <sup>th</sup> Cavalry  | 45:34:05N/107:26:26W | 87                        | 360                         |
| 1/C/7 <sup>th</sup> Cavalry | 45:33:38N/107:23:39W | 339                       | 360                         |
| 2/C/7 <sup>th</sup> Cavalry | 45:33:39N/107:23:41W | 348                       | 360                         |
| 3/C/7 <sup>th</sup> Cavalry | 45:33:38N/107:23:37W | 303                       | 360                         |
| 1/E/7 <sup>th</sup> Cavalry | 45:34:04N/107:26:28W | 85                        | 360                         |
| 2/E/7 <sup>th</sup> Cavalry | 45:34:03N/107:26:29W | 84                        | 360                         |
| 3/E/7 <sup>th</sup> Cavalry | 45:34:03N/107:26:31W | 82                        | 360                         |
| 1/F/7 <sup>th</sup> Cavalry | 45:34:02N/107:26:32W | 81                        | 360                         |
| 2/F/7 <sup>th</sup> Cavalry | 45:34:01N/107:26:35W | 78                        | 360                         |
| 3/F/7 <sup>th</sup> Cavalry | 45:34:02N/107:26:33W | 79                        | 360                         |
| 1/I/7 <sup>th</sup> Cavalry | 45:33:34N/107:23:30W | 324                       | 360                         |
| 2/I/7 <sup>th</sup> Cavalry | 45:33:33N/107:23:28W | 323                       | 360                         |
| 3/I/7 <sup>th</sup> Cavalry | 45:33:32N/107:23:27W | 322                       | 360                         |
| 1/L/7 <sup>th</sup> Cavalry | 45:33:37N/107:23:35W | 327                       | 360                         |
| 2/L/7 <sup>th</sup> Cavalry | 45:33:35N/107:23:32W | 324                       | 360                         |
| 3/L/7 <sup>th</sup> Cavalry | 45:33:36N/107:23:33W | 325                       | 360                         |

Table 24. Fox Cavalry Initial Locations

| Unit           | Location             | Orientation<br>in Degrees | Line of Sight<br>in Degrees |
|----------------|----------------------|---------------------------|-----------------------------|
| 1/Indians      | 45:34:39N/107:24:46W | 188                       | 360                         |
| 1/B&A/Indians  | 45:34:40N/107:24:47W | 66                        | 360                         |
| 2/Indians      | 45:33:39N/107:25:58W | 45                        | 360                         |
| 2/B&A/Indians  | 45:34:40N/107:24:50W | 167                       | 360                         |
| 3/Indians      | 45:34:38N/107:24:49W | 118                       | 360                         |
| 3/B&A/Indians  | 45:34:38N/107:24:47W | 158                       | 360                         |
| 4/Indians      | 45:33:25N/107:23:57W | 48                        | 360                         |
| 4/B&A/Indians  | 45:33:23N/107:25:25W | 45                        | 360                         |
| 5/Indians      | 45:34:39N/107:24:48W | 42                        | 360                         |
| 5/B&A/Indians  | 45:33:22N/107:24:26W | 42                        | 360                         |
| 6/Indians      | 45:33:29N/107:24:05W | 14                        | 360                         |
| 6/B&A/Indians  | 45:33:27N/107:24:06W | 15                        | 360                         |
| 7/Indians      | 45:33:37N/107:24:45W | 36                        | 360                         |
| 7/B&A/Indians  | 45:33:36N/107:24:46W | 32                        | 360                         |
| 8/Indians      | 45:33:37N/107:24:44W | 31                        | 360                         |
| 8/B&A/Indians  | 45:33:37N/107:24:46W | 36                        | 360                         |
| 9/Indians      | 45:33:38N/107:24:06W | 326                       | 360                         |
| 9/B&A/Indians  | 45:33:36N/107:24:09W | 349                       | 360                         |
| 10/Indians     | 45:33:26N/107:25:17W | 41                        | 360                         |
| 10/B&A/Indians | 45:33:24N/107:25:19W | 40                        | 360                         |
| 11/Indians     | 45:34:39N/107:24:48W | 143                       | 360                         |
| 11/B&A/Indians | 45:34:40N/107:24:50W | 134                       | 360                         |
| 12/Indians     | 45:33:40N/107:26:00W | 87                        | 360                         |
| 12/B&A/Indians | 45:33:40N/107:26:01W | 76                        | 360                         |

Table 25. Gray Indian Initial Locations



| Unit                        | Location             | Orientation<br>in Degrees | Line of Sight<br>in Degrees |
|-----------------------------|----------------------|---------------------------|-----------------------------|
| HQ/7 <sup>th</sup> Cavalry  | 45:33:39N/107:23:40W | 355                       | 360                         |
| 1/C/7 <sup>th</sup> Cavalry | 45:33:38N/107:23:38W | 338                       | 360                         |
| 2/C/7 <sup>th</sup> Cavalry | 45:33:39N/107:23:41W | 348                       | 360                         |
| 3/C/7 <sup>th</sup> Cavalry | 45:33:38N/107:23:37W | 308                       | 360                         |
| 1/E/7 <sup>th</sup> Cavalry | 45:33:36N/107:23:33W | 327                       | 360                         |
| 2/E/7 <sup>th</sup> Cavalry | 45:33:36N/107:23:34W | 329                       | 360                         |
| 3/E/7 <sup>th</sup> Cavalry | 45:33:37N/107:23:36W | 311                       | 360                         |
| 1/F/7 <sup>th</sup> Cavalry | 45:33:33N/107:23:29W | 322                       | 360                         |
| 2/F/7 <sup>th</sup> Cavalry | 45:33:35N/107:23:31W | 324                       | 360                         |
| 3/F/7 <sup>th</sup> Cavalry | 45:33:34N/107:23:30W | 323                       | 360                         |
| 1/I/7 <sup>th</sup> Cavalry | 45:33:30N/107:23:23W | 320                       | 360                         |
| 2/I/7 <sup>th</sup> Cavalry | 45:33:29N/107:23:22W | 320                       | 360                         |
| 3/I/7 <sup>th</sup> Cavalry | 45:33:28N/107:23:19W | 319                       | 360                         |
| 1/L/7 <sup>th</sup> Cavalry | 45:33:32N/107:23:26W | 320                       | 360                         |
| 2/L/7 <sup>th</sup> Cavalry | 45:33:31N/107:23:25W | 319                       | 360                         |
| 3/L/7 <sup>th</sup> Cavalry | 45:33:32N/107:23:27W | 321                       | 360                         |

Table 26. Gray Cavalry Initial Locations

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## APPENDIX C. JCATS OUTPUT

### A. DIRECT FIRE LOSSES

The weapons of the entities listed in the JCATS output charts below are abbreviated as follows:

|     |   |                         |     |   |                            |
|-----|---|-------------------------|-----|---|----------------------------|
| Bow | = | Bow & Arrow             | Hen | = | Henry Repeating Rifle      |
| Smo | = | Smoothbore Muzzleloader | Win | = | Winchester Repeating Rifle |
| Rif | = | Rifled Muzzleloader     | Spr | = | Springfield 1873 Rifle     |
| Sha | = | Sharp's Rifle           |     |   |                            |

## 1. Ambrose

| <u>Ambrose 3-1 Direct Fire Losses</u> |              |              | Total  | 2                                     | Cav w/Spring | Indian w/Smo | 19     |
|---------------------------------------|--------------|--------------|--------|---------------------------------------|--------------|--------------|--------|
| Side                                  | Target       | Shooter      | Killed | 2                                     | Cav w/Spring | Indian w/Sha | 21     |
| 1                                     | Indian w/Bow | Cav w/Spring | 553    | 2                                     | Cav w/Spring | Indian w/Win | 83     |
| 1                                     | Indian w/Sha | Cav w/Spring | 10     | 2                                     | Cav w/Spring | Indian w/Spr | 9      |
| 1                                     | Indian w/Smo | Cav w/Spring | 28     | 2                                     | Cav w/Spring | Indian w/Bow | 20     |
| 1                                     | Indian w/Win | Cav w/Spring | 36     | 2                                     | Cav w/Spring | Indian w/Hen | 37     |
| 1                                     | Indian w/Rif | Cav w/Spring | 32     | 2                                     | Cav w/Spring | Indian w/Rif | 16     |
| 1                                     | Indian w/Hen | Cav w/Spring | 26     | <u>Ambrose 3-4 Direct Fire Losses</u> |              |              | Total  |
| 1                                     | Indian w/Spr | Cav w/Spring | 6      | Side                                  | Target       | Shooter      | Killed |
| 2                                     | Cav w/Spring | Indian w/Smo | 13     | 1                                     | Indian w/Bow | Cav w/Spring | 562    |
| 2                                     | Cav w/Spring | Indian w/Hen | 51     | 1                                     | Indian w/Smo | Cav w/Spring | 28     |
| 2                                     | Cav w/Spring | Indian w/Rif | 24     | 1                                     | Indian w/Hen | Cav w/Spring | 27     |
| 2                                     | Cav w/Spring | Indian w/Win | 72     | 1                                     | Indian w/Win | Cav w/Spring | 42     |
| 2                                     | Cav w/Spring | Indian w/Spr | 14     | 1                                     | Indian w/Spr | Cav w/Spring | 8      |
| 2                                     | Cav w/Spring | Indian w/Bow | 15     | 1                                     | Indian w/Rif | Cav w/Spring | 25     |
| 2                                     | Cav w/Spring | Indian w/Sha | 16     | 1                                     | Indian w/Sha | Cav w/Spring | 11     |
|                                       |              |              |        | 2                                     | Cav w/Spring | Indian w/Sha | 20     |
|                                       |              |              |        | 2                                     | Cav w/Spring | Indian w/Rif | 27     |
| <u>Ambrose 3-2 Direct Fire Losses</u> |              |              | Total  | 2                                     | Cav w/Spring | Indian w/Smo | 26     |
| Side                                  | Target       | Shooter      | Killed | 2                                     | Cav w/Spring | Indian w/Win | 57     |
| 1                                     | Indian w/Bow | Cav w/Spring | 551    | 2                                     | Cav w/Spring | Indian w/Hen | 42     |
| 1                                     | Indian w/Win | Cav w/Spring | 38     | 2                                     | Cav w/Spring | Indian w/Bow | 22     |
| 1                                     | Indian w/Smo | Cav w/Spring | 39     | 2                                     | Cav w/Spring | Indian w/Spr | 11     |
| 1                                     | Indian w/Rif | Cav w/Spring | 36     |                                       |              |              |        |
| 1                                     | Indian w/Sha | Cav w/Spring | 18     | <u>Ambrose 3-5 Direct Fire Losses</u> |              |              | Total  |
| 1                                     | Indian w/Spr | Cav w/Spring | 10     | Side                                  | Target       | Shooter      | Killed |
| 1                                     | Indian w/Hen | Cav w/Spring | 32     | 1                                     | Indian w/Bow | Cav w/Spring | 554    |
| 2                                     | Cav w/Spring | Indian w/Win | 59     | 1                                     | Indian w/Hen | Cav w/Spring | 44     |
| 2                                     | Cav w/Spring | Indian w/Smo | 16     | 1                                     | Indian w/Smo | Cav w/Spring | 50     |
| 2                                     | Cav w/Spring | Indian w/Rif | 22     | 1                                     | Indian w/Rif | Cav w/Spring | 45     |
| 2                                     | Cav w/Spring | Indian w/Hen | 51     | 1                                     | Indian w/Sha | Cav w/Spring | 19     |
| 2                                     | Cav w/Spring | Indian w/Sha | 23     | 1                                     | Indian w/Sha | Cav w/Spring | 19     |
| 2                                     | Cav w/Spring | Indian w/Bow | 18     | 1                                     | Indian w/Win | Cav w/Spring | 54     |
| 2                                     | Cav w/Spring | Indian w/Spr | 16     | 1                                     | Indian w/Spr | Cav w/Spring | 10     |
|                                       |              |              |        | 2                                     | Cav w/Spring | Indian w/Win | 64     |
| <u>Ambrose 3-3 Direct Fire Losses</u> |              |              | Total  | 2                                     | Cav w/Spring | Indian w/Rif | 33     |
| Side                                  | Target       | Shooter      | Killed | 2                                     | Cav w/Spring | Indian w/Hen | 38     |
| 1                                     | Indian w/Hen | Cav w/Spring | 54     | 2                                     | Cav w/Spring | Indian w/Sha | 26     |
| 1                                     | Indian w/Rif | Cav w/Spring | 58     | 2                                     | Cav w/Spring | Indian w/Bow | 21     |
| 1                                     | Indian w/Bow | Cav w/Spring | 553    | 2                                     | Cav w/Spring | Indian w/Smo | 11     |
| 1                                     | Indian w/Win | Cav w/Spring | 63     | 2                                     | Cav w/Spring | Indian w/Spr | 12     |
| 1                                     | Indian w/Smo | Cav w/Spring | 53     |                                       |              |              |        |
| 1                                     | Indian w/Spr | Cav w/Spring | 17     | <u>Ambrose 3-6 Direct Fire Losses</u> |              |              | Total  |
| 1                                     | Indian w/Sha | Cav w/Spring | 16     | Side                                  | Target       | Shooter      | Killed |

|                                       |              |              |        |  |              |              |        |
|---------------------------------------|--------------|--------------|--------|--|--------------|--------------|--------|
| 1                                     | Indian w/Bow | Cav w/Spring | 551    | 2                                      | Cav w/Spring | Indian w/Hen | 50     |
| 1                                     | Indian w/Rif | Cav w/Spring | 33     | 2                                      | Cav w/Spring | Indian w/Smo | 20     |
| 1                                     | Indian w/Win | Cav w/Spring | 34     | 2                                      | Cav w/Spring | Indian w/Bow | 19     |
| 1                                     | Indian w/Smo | Cav w/Spring | 31     | 2                                      | Cav w/Spring | Indian w/Rif | 18     |
| 1                                     | Indian w/Hen | Cav w/Spring | 36     | 2                                      | Cav w/Spring | Indian w/Sho | 33     |
| 1                                     | Indian w/Spr | Cav w/Spring | 7      | 2                                      | Cav w/Spring | Indian w/Spr | 8      |
| 1                                     | Indian w/Sho | Cav w/Spring | 9      |  |              |              |        |
| 2                                     | Cav w/Spring | Indian w/Rif | 22     | <b>Ambrose 3-9 Direct Fire Losses</b>  |              |              | Total  |
| 2                                     | Cav w/Spring | Indian w/Spr | 7      | Side                                   | Target       | Shooter      | Killed |
| 2                                     | Cav w/Spring | Indian w/Hen | 58     | 1                                      | Indian w/Bow | Cav w/Spring | 559    |
| 2                                     | Cav w/Spring | Indian w/Win | 54     | 1                                      | Indian w/Win | Cav w/Spring | 34     |
| 2                                     | Cav w/Spring | Indian w/Smo | 21     | 1                                      | Indian w/Hen | Cav w/Spring | 36     |
| 2                                     | Cav w/Spring | Indian w/Bow | 25     | 1                                      | Indian w/Smo | Cav w/Spring | 28     |
| 2                                     | Cav w/Spring | Indian w/Sho | 18     | 1                                      | Indian w/Sho | Cav w/Spring | 13     |
| <b>Ambrose 3-7 Direct Fire Losses</b> |              |              | Total  | 1                                      | Indian w/Rif | Cav w/Spring | 28     |
| Side                                  | Target       | Shooter      | Killed | 1                                      | Indian w/Spr | Cav w/Spring | 7      |
| 1                                     | Indian w/Bow | Cav w/Spring | 551    | 2                                      | Cav w/Spring | Indian w/Hen | 65     |
| 1                                     | Indian w/Win | Cav w/Spring | 80     | 2                                      | Cav w/Spring | Indian w/Win | 60     |
| 1                                     | Indian w/Spr | Cav w/Spring | 17     | 2                                      | Cav w/Spring | Indian w/Rif | 21     |
| 1                                     | Indian w/Sho | Cav w/Spring | 27     | 2                                      | Cav w/Spring | Indian w/Bow | 18     |
| 1                                     | Indian w/Rif | Cav w/Spring | 62     | 2                                      | Cav w/Spring | Indian w/Smo | 13     |
| 1                                     | Indian w/Hen | Cav w/Spring | 71     | 2                                      | Cav w/Spring | Indian w/Sho | 25     |
| 1                                     | Indian w/Smo | Cav w/Spring | 62     | 2                                      | Cav w/Spring | Indian w/Spr | 3      |
| 2                                     | Cav w/Spring | Indian w/Hen | 49     |  |              |              |        |
| 2                                     | Cav w/Spring | Indian w/Win | 76     | <b>Ambrose 3-10 Direct Fire Losses</b> |              |              | Total  |
| 2                                     | Cav w/Spring | Indian w/Rif | 13     | Side                                   | Target       | Shooter      | Killed |
| 2                                     | Cav w/Spring | Indian w/Sho | 23     | 1                                      | Indian w/Bow | Cav w/Spring | 558    |
| 2                                     | Cav w/Spring | Indian w/Smo | 16     | 1                                      | Indian w/Win | Cav w/Spring | 51     |
| 2                                     | Cav w/Spring | Indian w/Bow | 20     | 1                                      | Indian w/Hen | Cav w/Spring | 34     |
| 2                                     | Cav w/Spring | Indian w/Spr | 8      | 1                                      | Indian w/Sho | Cav w/Spring | 14     |
|                                       |              |              |        | 1                                      | Indian w/Rif | Cav w/Spring | 36     |
| <b>Ambrose 3-8 Direct Fire Losses</b> |              |              | Total  | 1                                      | Indian w/Smo | Cav w/Spring | 35     |
| Side                                  | Target       | Shooter      | Killed | 1                                      | Indian w/Spr | Cav w/Spring | 8      |
| 1                                     | Indian w/Bow | Cav w/Spring | 556    | 2                                      | Cav w/Spring | Indian w/Smo | 14     |
| 1                                     | Indian w/Win | Cav w/Spring | 58     | 2                                      | Cav w/Spring | Indian w/Win | 100    |
| 1                                     | Indian w/Smo | Cav w/Spring | 54     | 2                                      | Cav w/Spring | Indian w/Hen | 49     |
| 1                                     | Indian w/Rif | Cav w/Spring | 57     | 2                                      | Cav w/Spring | Indian w/Sho | 15     |
| 1                                     | Indian w/Spr | Cav w/Spring | 14     | 2                                      | Cav w/Spring | Indian w/Bow | 16     |
| 1                                     | Indian w/Hen | Cav w/Spring | 52     | 2                                      | Cav w/Spring | Indian w/Rif | 5      |
| 1                                     | Indian w/Sho | Cav w/Spring | 20     | 2                                      | Cav w/Spring | Indian w/Spr | 6      |
| 2                                     | Cav w/Spring | Indian w/Win | 57     |  |              |              |        |

|      |   |              |        |   |              |              |    |
|------|---|--------------|--------|---|--------------|--------------|----|
| 1    | Indian w/Win                              | Cav w/Spring | 23     | 2 | Cav w/Spring | Indian w/Hen | 37 |
| 1    | Indian w/Sha                              | Cav w/Spring | 7      | 2 | Cav w/Spring | Indian w/Win | 50 |
| 1    | Indian w/Bow                              | Cav w/Spring | 101    | 2 | Cav w/Spring | Indian w/Bow | 72 |
| 1    | Indian w/Smo                              | Cav w/Spring | 10     | 2 | Cav w/Spring | Indian w/Smo | 15 |
| 1    | Indian w/Spr                              | Cav w/Spring | 8      | 2 | Cav w/Spring | Indian w/Spr | 10 |
| 1    | Indian w/Hen                              | Cav w/Spring | 14     | 2 | Cav w/Spring | Indian w/Rif | 5  |
| 1    | Indian w/Rif                              | Cav w/Spring | 11     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Win | 52     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Hen | 49     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Bow | 53     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 18     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Rif | 12     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Smo | 11     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Spr | 10     |   |              |              |    |
|      | <b><u>Fox 3-5 Direct Fire Losses</u></b>  |              | Total  |   |              |              |    |
| Side | Target                                    | Shooter      | Killed |   |              |              |    |
| 1    | Indian w/Win                              | Cav w/Spring | 8      |   |              |              |    |
| 1    | Indian w/Rif                              | Cav w/Spring | 3      |   |              |              |    |
| 1    | Indian w/Smo                              | Cav w/Spring | 2      |   |              |              |    |
| 1    | Indian w/Sha                              | Cav w/Spring | 4      |   |              |              |    |
| 1    | Indian w/Bow                              | Cav w/Spring | 75     |   |              |              |    |
| 1    | Indian w/Hen                              | Cav w/Spring | 4      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Win | 52     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Hen | 32     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Spr | 8      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Rif | 19     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Bow | 65     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 16     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Smo | 13     |   |              |              |    |
|      | <b><u>Fox 3-6 Direct Fire Losses</u></b>  |              | Total  |   |              |              |    |
| Side | Target                                    | Shooter      | Killed |   |              |              |    |
| 1    | Indian w/Hen                              | Cav w/Spring | 2      |   |              |              |    |
| 1    | Indian w/Sha                              | Cav w/Spring | 1      |   |              |              |    |
| 1    | Indian w/Rif                              | Cav w/Spring | 8      |   |              |              |    |
| 1    | Indian w/Smo                              | Cav w/Spring | 6      |   |              |              |    |
| 1    | Indian w/Bow                              | Cav w/Spring | 13     |   |              |              |    |
| 1    | Indian w/Win                              | Cav w/Spring | 6      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Hen | 40     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Win | 54     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 16     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Smo | 7      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Bow | 70     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Spr | 6      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Rif | 12     |   |              |              |    |
|      | <b><u>Fox 3-7 Direct Fire Losses</u></b>  |              | Total  |   |              |              |    |
| Side | Target                                    | Shooter      | Killed |   |              |              |    |
| 1    | Indian w/Hen                              | Cav w/Spring | 10     |   |              |              |    |
| 1    | Indian w/Win                              | Cav w/Spring | 7      |   |              |              |    |
| 1    | Indian w/Rif                              | Cav w/Spring | 6      |   |              |              |    |
| 1    | Indian w/Bow                              | Cav w/Spring | 19     |   |              |              |    |
| 1    | Indian w/Smo                              | Cav w/Spring | 3      |   |              |              |    |
| 1    | Indian w/Spr                              | Cav w/Spring | 1      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 16     |   |              |              |    |
|      | <b><u>Fox 3-8 Direct Fire Losses</u></b>  |              | Total  |   |              |              |    |
| Side | Target                                    | Shooter      | Killed |   |              |              |    |
| 1    | Indian w/Sha                              | Cav w/Spring | 11     |   |              |              |    |
| 1    | Indian w/Win                              | Cav w/Spring | 27     |   |              |              |    |
| 1    | Indian w/Bow                              | Cav w/Spring | 68     |   |              |              |    |
| 1    | Indian w/Hen                              | Cav w/Spring | 19     |   |              |              |    |
| 1    | Indian w/Spr                              | Cav w/Spring | 4      |   |              |              |    |
| 1    | Indian w/Rif                              | Cav w/Spring | 10     |   |              |              |    |
| 1    | Indian w/Smo                              | Cav w/Spring | 12     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Win | 49     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Smo | 16     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 9      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Hen | 34     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Bow | 71     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Rif | 20     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Spr | 6      |   |              |              |    |
|      | <b><u>Fox 3-9 Direct Fire Losses</u></b>  |              | Total  |   |              |              |    |
| Side | Target                                    | Shooter      | Killed |   |              |              |    |
| 1    | Indian w/Win                              | Cav w/Spring | 14     |   |              |              |    |
| 1    | Indian w/Rif                              | Cav w/Spring | 8      |   |              |              |    |
| 1    | Indian w/Sha                              | Cav w/Spring | 3      |   |              |              |    |
| 1    | Indian w/Smo                              | Cav w/Spring | 9      |   |              |              |    |
| 1    | Indian w/Spr                              | Cav w/Spring | 3      |   |              |              |    |
| 1    | Indian w/Bow                              | Cav w/Spring | 33     |   |              |              |    |
| 1    | Indian w/Hen                              | Cav w/Spring | 10     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Win | 57     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Hen | 38     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Bow | 68     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Spr | 7      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Rif | 15     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 9      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Smo | 11     |   |              |              |    |
|      | <b><u>Fox 3-10 Direct Fire Losses</u></b> |              | Total  |   |              |              |    |
| Side | Target                                    | Shooter      | Killed |   |              |              |    |
| 1    | Indian w/Bow                              | Cav w/Spring | 36     |   |              |              |    |
| 1    | Indian w/Win                              | Cav w/Spring | 11     |   |              |              |    |
| 1    | Indian w/Rif                              | Cav w/Spring | 13     |   |              |              |    |
| 1    | Indian w/Sha                              | Cav w/Spring | 4      |   |              |              |    |
| 1    | Indian w/Smo                              | Cav w/Spring | 11     |   |              |              |    |
| 1    | Indian w/Hen                              | Cav w/Spring | 13     |   |              |              |    |
| 1    | Indian w/Spr                              | Cav w/Spring | 4      |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Win | 58     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Rif | 20     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Sha | 12     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Spr | 11     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Smo | 18     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Hen | 28     |   |              |              |    |
| 2    | Cav w/Spring                              | Indian w/Bow | 58     |   |              |              |    |

### 3. Gray

|      |   |              |        |  |  |  |  |
|------|---|--------------|--------|--|--|--|--|
|      | <b><u>Gray 3-1 Direct Fire Losses</u></b> |              | Total  |  |  |  |  |
| Side | Target                                    | Shooter      | Killed |  |  |  |  |
| 1    | Indian w/Spr                              | Cav w/Spring | 12     |  |  |  |  |
| 1    | Indian w/Win                              | Cav w/Spring | 48     |  |  |  |  |
| 1    | Indian w/Rif                              | Cav w/Spring | 43     |  |  |  |  |
| 1    | Indian w/Smo                              | Cav w/Spring | 48     |  |  |  |  |
| 1    | Indian w/Sha                              | Cav w/Spring | 16     |  |  |  |  |
| 1    | Indian w/Bow                              | Cav w/Spring | 69     |  |  |  |  |
| 1    | Indian w/Hen                              | Cav w/Spring | 49     |  |  |  |  |
|      | <b><u>Gray 3-2 Direct Fire Losses</u></b> |              | Total  |  |  |  |  |
| Side | Target                                    | Shooter      | Killed |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Rif | 27     |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Smo | 22     |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Win | 76     |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Sha | 31     |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Bow | 3      |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Hen | 33     |  |  |  |  |
| 2    | Cav w/Spring                              | Indian w/Spr | 13     |  |  |  |  |

|   |              |              |              |  |              |              |              |
|---|--------------|--------------|--------------|--|--------------|--------------|--------------|
| 1   | Indian w/Hen | Cav w/Spring | 22           | 1  | Indian w/Bow | Cav w/Spring | 33           |
| 1   | Indian w/Spr | Cav w/Spring | 4            | 1  | Indian w/Sha | Cav w/Spring | 4            |
| 1   | Indian w/Win | Cav w/Spring | 19           | 1  | Indian w/Hen | Cav w/Spring | 9            |
| 1   | Indian w/Smo | Cav w/Spring | 9            | 1  | Indian w/Spr | Cav w/Spring | 5            |
| 1   | Indian w/Rif | Cav w/Spring | 13           | 1  | Indian w/Rif | Cav w/Spring | 23           |
| 1   | Indian w/Bow | Cav w/Spring | 8            | 2  | Cav w/Spring | Indian w/Win | 93           |
| 2   | Cav w/Spring | Indian w/Spr | 17           | 2  | Cav w/Spring | Indian w/Sha | 28           |
| 2   | Cav w/Spring | Indian w/Smo | 25           | 2  | Cav w/Spring | Indian w/Smo | 22           |
| 2   | Cav w/Spring | Indian w/Win | 82           | 2  | Cav w/Spring | Indian w/Rif | 30           |
| 2   | Cav w/Spring | Indian w/Hen | 27           | 2  | Cav w/Spring | Indian w/Spr | 5            |
| 2   | Cav w/Spring | Indian w/Bow | 3            | 2  | Cav w/Spring | Indian w/Hen | 26           |
| 2   | Cav w/Spring | Indian w/Sha | 27           | 2  | Cav w/Spring | Indian w/Bow | 1            |
| 2   | Cav w/Spring | Indian w/Rif | 24           |  |              |              |              |
| <b><u>Gray 3-3 Direct Fire Losses</u></b> |              |              |              | <b><u>Gray 3-7 Direct Fire Losses</u></b>  |              |              |              |
| Side                                      | Target       | Shooter      | Total Killed | Side                                       | Target       | Shooter      | Total Killed |
| 1   | Indian w/Hen | Cav w/Spring | 17           | 1  | Indian w/Smo | Cav w/Spring | 11           |
| 1   | Indian w/Smo | Cav w/Spring | 27           | 1  | Indian w/Win | Cav w/Spring | 12           |
| 1   | Indian w/Win | Cav w/Spring | 41           | 1  | Indian w/Rif | Cav w/Spring | 12           |
| 1   | Indian w/Sha | Cav w/Spring | 13           | 1  | Indian w/Bow | Cav w/Spring | 35           |
| 1   | Indian w/Rif | Cav w/Spring | 32           | 1  | Indian w/Hen | Cav w/Spring | 8            |
| 1   | Indian w/Bow | Cav w/Spring | 7            | 1  | Indian w/Sha | Cav w/Spring | 3            |
| 1   | Indian w/Spr | Cav w/Spring | 10           | 1  | Indian w/Spr | Cav w/Spring | 4            |
| 2   | Cav w/Spring | Indian w/Rif | 22           | 2  | Cav w/Spring | Indian w/Win | 89           |
| 2   | Cav w/Spring | Indian w/Smo | 17           | 2  | Cav w/Spring | Indian w/Rif | 27           |
| 2   | Cav w/Spring | Indian w/Win | 84           | 2  | Cav w/Spring | Indian w/Sha | 23           |
| 2   | Cav w/Spring | Indian w/Sha | 24           | 2  | Cav w/Spring | Indian w/Bow | 2            |
| 2   | Cav w/Spring | Indian w/Bow | 5            | 2  | Cav w/Spring | Indian w/Smo | 18           |
| 2   | Cav w/Spring | Indian w/Hen | 38           | 2  | Cav w/Spring | Indian w/Hen | 33           |
| 2   | Cav w/Spring | Indian w/Spr | 15           | 2  | Cav w/Spring | Indian w/Spr | 13           |
| <b><u>Gray 3-4 Direct Fire Losses</u></b> |              |              |              | <b><u>Gray 3-8 Direct Fire Losses</u></b>  |              |              |              |
| Side                                      | Target       | Shooter      | Total Killed | Side                                       | Target       | Shooter      | Total Killed |
| 1   | Indian w/Rif | Cav w/Spring | 15           | 1  | Indian w/Win | Cav w/Spring | 21           |
| 1   | Indian w/Sha | Cav w/Spring | 6            | 1  | Indian w/Rif | Cav w/Spring | 18           |
| 1   | Indian w/Win | Cav w/Spring | 29           | 1  | Indian w/Sha | Cav w/Spring | 6            |
| 1   | Indian w/Spr | Cav w/Spring | 4            | 1  | Indian w/Spr | Cav w/Spring | 1            |
| 1   | Indian w/Smo | Cav w/Spring | 13           | 1  | Indian w/Hen | Cav w/Spring | 17           |
| 1   | Indian w/Hen | Cav w/Spring | 13           | 1  | Indian w/Smo | Cav w/Spring | 16           |
| 1   | Indian w/Bow | Cav w/Spring | 15           | 1  | Indian w/Bow | Cav w/Spring | 66           |
| 2   | Cav w/Spring | Indian w/Win | 83           | 2  | Cav w/Spring | Indian w/Smo | 26           |
| 2   | Cav w/Spring | Indian w/Hen | 37           | 2  | Cav w/Spring | Indian w/Win | 94           |
| 2   | Cav w/Spring | Indian w/Rif | 25           | 2  | Cav w/Spring | Indian w/Rif | 24           |
| 2   | Cav w/Spring | Indian w/Bow | 4            | 2  | Cav w/Spring | Indian w/Sha | 24           |
| 2   | Cav w/Spring | Indian w/Smo | 28           | 2  | Cav w/Spring | Indian w/Hen | 27           |
| 2   | Cav w/Spring | Indian w/Sha | 18           | 2  | Cav w/Spring | Indian w/Spr | 7            |
| 2   | Cav w/Spring | Indian w/Spr | 10           | 2  | Cav w/Spring | Indian w/Bow | 3            |
| <b><u>Gray 3-5 Direct Fire Losses</u></b> |              |              |              | <b><u>Gray 3-9 Direct Fire Losses</u></b>  |              |              |              |
| Side                                      | Target       | Shooter      | Total Killed | Side                                       | Target       | Shooter      | Total Killed |
| 1   | Indian w/Spr | Cav w/Spring | 7            | 1  | Indian w/Hen | Cav w/Spring | 25           |
| 1   | Indian w/Hen | Cav w/Spring | 24           | 1  | Indian w/Sha | Cav w/Spring | 5            |
| 1   | Indian w/Smo | Cav w/Spring | 21           | 1  | Indian w/Smo | Cav w/Spring | 22           |
| 1   | Indian w/Win | Cav w/Spring | 28           | 1  | Indian w/Win | Cav w/Spring | 26           |
| 1   | Indian w/Rif | Cav w/Spring | 24           | 1  | Indian w/Rif | Cav w/Spring | 25           |
| 1   | Indian w/Bow | Cav w/Spring | 87           | 1  | Indian w/Bow | Cav w/Spring | 65           |
| 1   | Indian w/Sha | Cav w/Spring | 8            | 1  | Indian w/Spr | Cav w/Spring | 5            |
| 2   | Cav w/Spring | Indian w/Win | 73           | 2  | Cav w/Spring | Indian w/Win | 91           |
| 2   | Cav w/Spring | Indian w/Smo | 26           | 2  | Cav w/Spring | Indian w/Rif | 18           |
| 2   | Cav w/Spring | Indian w/Sha | 25           | 2  | Cav w/Spring | Indian w/Smo | 17           |
| 2   | Cav w/Spring | Indian w/Bow | 3            | 2  | Cav w/Spring | Indian w/Bow | 6            |
| 2   | Cav w/Spring | Indian w/Rif | 30           | 2  | Cav w/Spring | Indian w/Sha | 32           |
| 2   | Cav w/Spring | Indian w/Hen | 34           | 2  | Cav w/Spring | Indian w/Hen | 34           |
| 2   | Cav w/Spring | Indian w/Spr | 14           | 2  | Cav w/Spring | Indian w/Spr | 7            |
| <b><u>Gray 3-6 Direct Fire Losses</u></b> |              |              |              | <b><u>Gray 3-10 Direct Fire Losses</u></b> |              |              |              |
| Side                                      | Target       | Shooter      | Total Killed | Side                                       | Target       | Shooter      | Total Killed |
| 1   | Indian w/Smo | Cav w/Spring | 15           | 1  | Indian w/Smo | Cav w/Spring | 31           |
| 1   | Indian w/Win | Cav w/Spring | 20           | 1  | Indian w/Hen | Cav w/Spring | 31           |
|   |              |              |              | 1  | Indian w/Rif | Cav w/Spring | 35           |

|   |              |              |    |   |              |              |    |
|---|--------------|--------------|----|---|--------------|--------------|----|
| 1 | Indian w/Win | Cav w/Spring | 48 | 2 | Cav w/Spring | Indian w/Win | 74 |
| 1 | Indian w/Sha | Cav w/Spring | 13 | 2 | Cav w/Spring | Indian w/Hen | 38 |
| 1 | Indian w/Bow | Cav w/Spring | 77 | 2 | Cav w/Spring | Indian w/Rif | 22 |
| 1 | Indian w/Spr | Cav w/Spring | 10 | 2 | Cav w/Spring | Indian w/Sha | 28 |
| 2 | Cav w/Spring | Indian w/Spr | 17 | 2 | Cav w/Spring | Indian w/Bow | 2  |
| 2 | Cav w/Spring | Indian w/Smo | 24 |   |              |              |    |

## B. DIRECT FIRE SHOTS

The weapons of the entities listed in the JCATS output charts below are abbreviated as follows:

|     |   |                         |     |   |                            |
|-----|---|-------------------------|-----|---|----------------------------|
| Bow | = | Bow & Arrow             | Sha | = | Sharp's Rifle              |
| Smo | = | Smoothbore Muzzleloader | Hen | = | Henry Repeating Rifle      |
| Rif | = | Rifled Muzzleloader     | Win | = | Winchester Repeating Rifle |
|     |   |                         | Spr | = | Springfield 1873 Rifle     |

The ranges are expressed kilometers. Example: 0.187 = 187 meters

### 1. Aambrose

#### Ambrose 3-1 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 291   | 0.078     | 0.187     | 0.147     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 284   | 0.074     | 0.186     | 0.146     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1135  | 0.077     | 0.197     | 0.152     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 240   | 0.074     | 0.187     | 0.148     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1990  | 0.069     | 0.187     | 0.151     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 140   | 0.081     | 0.185     | 0.148     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 504   | 0.021     | 0.069     | 0.043     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2360  | 0.035     | 0.364     | 0.108     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 132   | 0.037     | 0.057     | 0.045     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 97    | 0.076     | 0.395     | 0.206     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 103   | 0.056     | 0.368     | 0.217     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 88    | 0.047     | 0.371     | 0.187     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 94    | 0.090     | 0.379     | 0.242     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Colt 1873    | 1     | 0.021     | 0.021     | 0.021     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 1     | 0.007     | 0.007     | 0.007     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 1     | 0.044     | 0.044     | 0.044     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 22    | 0.057     | 0.381     | 0.212     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 2     | 0.034     | 0.038     | 0.036     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 29    | 0.080     | 0.363     | 0.217     |

#### Ambrose 3-2 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1382  | 0.065     | 0.189     | 0.148     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2033  | 0.070     | 0.185     | 0.146     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 292   | 0.079     | 0.185     | 0.141     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 275   | 0.085     | 0.186     | 0.146     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 305   | 0.077     | 0.185     | 0.143     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 152   | 0.073     | 0.186     | 0.143     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 458   | 0.023     | 0.056     | 0.042     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2102  | 0.037     | 0.367     | 0.110     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 145   | 0.029     | 0.051     | 0.043     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 110   | 0.041     | 0.386     | 0.229     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 103   | 0.040     | 0.369     | 0.184     |

|   |              |   |              |             |     |       |       |       |
|---|--------------|---|--------------|-------------|-----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Win | Springfield | 124 | 0.039 | 0.347 | 0.188 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Springfield | 100 | 0.039 | 0.363 | 0.192 |
| 2 | Cav w/Spring | 1 | Indian w/Sha | Springfield | 38  | 0.047 | 0.351 | 0.178 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield | 29  | 0.042 | 0.366 | 0.228 |
| 2 | Cav w/Spring | 1 | Indian w/Rif | Colt 1873   | 1   | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | 1 | Indian w/Win | Colt 1873   | 4   | 0.021 | 0.038 | 0.034 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Colt 1873   | 1   | 0.042 | 0.042 | 0.042 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Colt 1873   | 3   | 0.045 | 0.047 | 0.046 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Colt 1873   | 3   | 0.042 | 0.042 | 0.042 |

### **Ambrose 3-3 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1614  | 0.062     | 0.185     | 0.150     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 253   | 0.067     | 0.186     | 0.144     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 256   | 0.079     | 0.195     | 0.145     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 227   | 0.076     | 0.185     | 0.145     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 858   | 0.070     | 0.193     | 0.149     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 120   | 0.079     | 0.186     | 0.149     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 435   | 0.000     | 0.062     | 0.041     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2126  | 0.034     | 0.327     | 0.107     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 146   | 0.034     | 0.348     | 0.172     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 116   | 0.040     | 0.333     | 0.154     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 130   | 0.037     | 0.317     | 0.150     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 119   | 0.037     | 0.329     | 0.156     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 40    | 0.039     | 0.316     | 0.161     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 28    | 0.040     | 0.315     | 0.139     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 128   | 0.020     | 0.053     | 0.044     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 8     | 0.024     | 0.043     | 0.038     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 7     | 0.036     | 0.047     | 0.045     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 5     | 0.034     | 0.038     | 0.037     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 6     | 0.034     | 0.041     | 0.037     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 1     | 0.043     | 0.043     | 0.043     |

### **Ambrose 3-4 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 305   | 0.077     | 0.191     | 0.146     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 170   | 0.078     | 0.185     | 0.143     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 348   | 0.070     | 0.185     | 0.145     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 349   | 0.077     | 0.185     | 0.140     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1549  | 0.078     | 0.193     | 0.154     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2072  | 0.080     | 0.186     | 0.155     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 429   | 0.029     | 0.060     | 0.044     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2249  | 0.018     | 0.253     | 0.104     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 127   | 0.011     | 0.057     | 0.043     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 108   | 0.016     | 0.220     | 0.105     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 86    | 0.017     | 0.259     | 0.110     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 25    | 0.037     | 0.199     | 0.109     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 28    | 0.037     | 0.228     | 0.098     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 82    | 0.020     | 0.238     | 0.100     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 81    | 0.020     | 0.247     | 0.115     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 6     | 0.022     | 0.046     | 0.035     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 1     | 0.040     | 0.040     | 0.040     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 3     | 0.036     | 0.036     | 0.036     |

### **Ambrose 3-5 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2027  | 0.066     | 0.185     | 0.154     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 294   | 0.080     | 0.214     | 0.148     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1487  | 0.075     | 0.220     | 0.157     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 360   | 0.080     | 0.186     | 0.143     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 330   | 0.071     | 0.185     | 0.145     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 179   | 0.079     | 0.215     | 0.145     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 1128  | 0.018     | 0.053     | 0.039     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2308  | 0.032     | 0.362     | 0.111     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 143   | 0.037     | 0.058     | 0.045     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 154   | 0.042     | 0.416     | 0.211     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 136   | 0.043     | 0.398     | 0.162     |



|   |              |   |              |             |     |       |       |       |
|---|--------------|---|--------------|-------------|-----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Rif | Springfield | 113 | 0.041 | 0.374 | 0.169 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Springfield | 125 | 0.041 | 0.391 | 0.191 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Colt 1873   | 8   | 0.028 | 0.050 | 0.043 |
| 2 | Cav w/Spring | 1 | Indian w/Rif | Colt 1873   | 5   | 0.012 | 0.050 | 0.036 |
| 2 | Cav w/Spring | 1 | Indian w/Sha | Springfield | 40  | 0.042 | 0.398 | 0.179 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield | 22  | 0.043 | 0.352 | 0.197 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Colt 1873   | 2   | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Colt 1873   | 4   | 0.043 | 0.046 | 0.045 |

### **Ambrose 3-6 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2046  | 0.069     | 0.186     | 0.148     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 264   | 0.078     | 0.185     | 0.147     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1232  | 0.073     | 0.197     | 0.153     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 302   | 0.076     | 0.185     | 0.144     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 325   | 0.079     | 0.184     | 0.140     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 153   | 0.088     | 0.185     | 0.144     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 967   | 0.017     | 0.061     | 0.039     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2084  | 0.033     | 0.377     | 0.111     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 128   | 0.034     | 0.057     | 0.044     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 108   | 0.035     | 0.397     | 0.210     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 86    | 0.069     | 0.387     | 0.246     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 86    | 0.016     | 0.384     | 0.218     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 102   | 0.038     | 0.402     | 0.252     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 26    | 0.085     | 0.368     | 0.245     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 1     | 0.020     | 0.020     | 0.020     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 1     | 0.038     | 0.038     | 0.038     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 20    | 0.063     | 0.390     | 0.250     |

### **Ambrose 3-7 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1113  | 0.065     | 0.222     | 0.155     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 218   | 0.069     | 0.213     | 0.151     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1629  | 0.058     | 0.195     | 0.151     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 255   | 0.069     | 0.201     | 0.146     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 120   | 0.076     | 0.206     | 0.147     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 235   | 0.078     | 0.195     | 0.144     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 633   | 0.012     | 0.052     | 0.040     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2103  | 0.031     | 0.366     | 0.112     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 142   | 0.033     | 0.051     | 0.045     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 154   | 0.043     | 0.357     | 0.214     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 178   | 0.034     | 0.348     | 0.207     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 41    | 0.038     | 0.365     | 0.207     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 162   | 0.011     | 0.371     | 0.227     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 6     | 0.025     | 0.044     | 0.038     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 56    | 0.040     | 0.352     | 0.216     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 139   | 0.042     | 0.369     | 0.227     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 4     | 0.036     | 0.042     | 0.040     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 5     | 0.043     | 0.049     | 0.045     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 10    | 0.041     | 0.049     | 0.046     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 1     | 0.046     | 0.046     | 0.046     |

### **Ambrose 3-8 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 305   | 0.073     | 0.186     | 0.146     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1245  | 0.068     | 0.196     | 0.157     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1652  | 0.071     | 0.185     | 0.157     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 263   | 0.083     | 0.186     | 0.148     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 144   | 0.079     | 0.185     | 0.147     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 331   | 0.074     | 0.185     | 0.142     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 412   | 0.029     | 0.052     | 0.042     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2353  | 0.036     | 0.380     | 0.114     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 116   | 0.037     | 0.064     | 0.046     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 148   | 0.041     | 0.398     | 0.243     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 134   | 0.042     | 0.389     | 0.236     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 154   | 0.035     | 0.393     | 0.224     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 50    | 0.043     | 0.394     | 0.231     |

|   |              |   |              |             |     |       |       |       |
|---|--------------|---|--------------|-------------|-----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Smo | Springfield | 142 | 0.042 | 0.391 | 0.262 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield | 32  | 0.061 | 0.379 | 0.228 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Colt 1873   | 6   | 0.038 | 0.046 | 0.042 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Colt 1873   | 2   | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | 1 | Indian w/Win | Colt 1873   | 4   | 0.044 | 0.044 | 0.044 |

### **Ambrose 3-9 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1258  | 0.069        | 0.194        | 0.150        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1946  | 0.066        | 0.185        | 0.150        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 293   | 0.068        | 0.186        | 0.145        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 257   | 0.074        | 0.185        | 0.147        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 145   | 0.072        | 0.185        | 0.145        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 310   | 0.071        | 0.185        | 0.145        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 360   | 0.033        | 0.061        | 0.043        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2170  | 0.035        | 0.347        | 0.108        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 105   | 0.035        | 0.050        | 0.045        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 107   | 0.049        | 0.383        | 0.210        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 34    | 0.038        | 0.349        | 0.174        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 80    | 0.039        | 0.365        | 0.194        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 90    | 0.037        | 0.362        | 0.171        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 91    | 0.046        | 0.375        | 0.191        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 16    | 0.045        | 0.332        | 0.204        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 1     | 0.028        | 0.028        | 0.028        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 2     | 0.041        | 0.041        | 0.041        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 2     | 0.049        | 0.049        | 0.049        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 2     | 0.038        | 0.039        | 0.039        |

### **Ambrose 3-10 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 753   | 0.077        | 0.216        | 0.148        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1328  | 0.069        | 0.186        | 0.142        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 174   | 0.083        | 0.211        | 0.146        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 213   | 0.079        | 0.188        | 0.142        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 213   | 0.077        | 0.185        | 0.141        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 93    | 0.083        | 0.215        | 0.146        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 479   | 0.027        | 0.059        | 0.042        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 2023  | 0.039        | 0.381        | 0.110        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 123   | 0.035        | 0.051        | 0.045        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 95    | 0.048        | 0.415        | 0.227        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 108   | 0.039        | 0.393        | 0.193        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 34    | 0.049        | 0.404        | 0.203        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 96    | 0.044        | 0.395        | 0.212        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 28    | 0.038        | 0.377        | 0.184        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 79    | 0.046        | 0.407        | 0.209        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 1     | 0.036        | 0.036        | 0.036        |

## **2. Fox**

### **Fox 3-1 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 514   | 0.054        | 0.185        | 0.127        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 433   | 0.044        | 0.188        | 0.130        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1844  | 0.065        | 0.194        | 0.142        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2712  | 0.080        | 0.193        | 0.133        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 250   | 0.064        | 0.194        | 0.129        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 528   | 0.034        | 0.185        | 0.128        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 6481  | 0.003        | 0.051        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 35    | 0.033        | 0.212        | 0.112        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 76    | 0.021        | 0.144        | 0.109        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 103   | 0.038        | 0.132        | 0.104        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 30    | 0.025        | 0.049        | 0.041        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 4     | 0.036        | 0.051        | 0.045        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 4     | 0.039        | 0.042        | 0.040        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 39    | 0.028        | 0.186        | 0.100        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 482   | 0.012        | 0.251        | 0.115        |

|   |              |   |              |             |    |       |       |       |
|---|--------------|---|--------------|-------------|----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Sha | Springfield | 32 | 0.022 | 0.128 | 0.104 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield | 10 | 0.101 | 0.185 | 0.135 |
| 2 | Cav w/Spring | 1 | Indian w/Sha | Colt 1873   | 9  | 0.027 | 0.049 | 0.040 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Colt 1873   | 4  | 0.012 | 0.048 | 0.039 |
| 2 | Cav w/Spring | 1 | Indian w/Bow | Colt 1873   | 22 | 0.018 | 0.049 | 0.036 |

### **Fox 3-2 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 220   | 0.074        | 0.191        | 0.131        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 442   | 0.078        | 0.190        | 0.128        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2323  | 0.075        | 0.192        | 0.136        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 444   | 0.065        | 0.188        | 0.130        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1494  | 0.064        | 0.191        | 0.139        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 378   | 0.074        | 0.186        | 0.131        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5737  | 0.004        | 0.050        | 0.039        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 68    | 0.012        | 0.274        | 0.094        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 92    | 0.018        | 0.276        | 0.092        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 139   | 0.005        | 0.215        | 0.101        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 33    | 0.007        | 0.048        | 0.031        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 45    | 0.006        | 0.164        | 0.092        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 95    | 0.022        | 0.279        | 0.104        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 20    | 0.011        | 0.048        | 0.024        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 7     | 0.030        | 0.043        | 0.035        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 39    | 0.002        | 0.049        | 0.034        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 639   | 0.004        | 0.281        | 0.108        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 22    | 0.010        | 0.254        | 0.081        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Colt 1873    | 7     | 0.009        | 0.044        | 0.030        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 14    | 0.006        | 0.040        | 0.021        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 3     | 0.042        | 0.042        | 0.042        |

### **Fox 3-3 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2824  | 0.077        | 0.185        | 0.134        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 249   | 0.071        | 0.196        | 0.135        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 435   | 0.065        | 0.193        | 0.135        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 494   | 0.058        | 0.185        | 0.135        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1861  | 0.060        | 0.199        | 0.140        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 520   | 0.060        | 0.185        | 0.127        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5518  | 0.004        | 0.051        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 100   | 0.024        | 0.138        | 0.106        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 371   | 0.009        | 0.197        | 0.113        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 54    | 0.038        | 0.172        | 0.111        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 26    | 0.089        | 0.130        | 0.110        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 37    | 0.020        | 0.183        | 0.103        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 8     | 0.022        | 0.135        | 0.095        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 23    | 0.020        | 0.219        | 0.109        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 5     | 0.037        | 0.040        | 0.039        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 13    | 0.016        | 0.042        | 0.035        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Colt 1873    | 4     | 0.047        | 0.050        | 0.049        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 3     | 0.002        | 0.039        | 0.027        |

### **Fox 3-4 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1751  | 0.059        | 0.200        | 0.145        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 409   | 0.044        | 0.199        | 0.135        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2456  | 0.060        | 0.190        | 0.140        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 490   | 0.032        | 0.196        | 0.132        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 424   | 0.060        | 0.191        | 0.132        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 234   | 0.064        | 0.197        | 0.135        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5876  | 0.001        | 0.051        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 568   | 0.005        | 0.285        | 0.121        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 122   | 0.006        | 0.284        | 0.112        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 90    | 0.009        | 0.277        | 0.113        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 33    | 0.013        | 0.278        | 0.105        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 31    | 0.014        | 0.262        | 0.110        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 69    | 0.019        | 0.272        | 0.106        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 56    | 0.019        | 0.269        | 0.106        |

|   |              |   |              |           |    |       |       |       |
|---|--------------|---|--------------|-----------|----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Win | Colt 1873 | 33 | 0.010 | 0.048 | 0.036 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Colt 1873 | 4  | 0.022 | 0.032 | 0.026 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Colt 1873 | 9  | 0.024 | 0.040 | 0.032 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Colt 1873 | 5  | 0.017 | 0.027 | 0.022 |
| 2 | Cav w/Spring | 1 | Indian w/Sha | Colt 1873 | 7  | 0.024 | 0.040 | 0.030 |
| 2 | Cav w/Spring | 1 | Indian w/Bow | Colt 1873 | 49 | 0.006 | 0.051 | 0.033 |
| 2 | Cav w/Spring | 1 | Indian w/Rif | Colt 1873 | 7  | 0.018 | 0.045 | 0.040 |

### **Fox 3-5 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2764  | 0.070        | 0.185        | 0.137        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 229   | 0.054        | 0.185        | 0.134        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1694  | 0.066        | 0.191        | 0.144        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 491   | 0.059        | 0.186        | 0.135        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 477   | 0.057        | 0.185        | 0.131        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 404   | 0.061        | 0.185        | 0.139        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5652  | 0.004        | 0.051        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 48    | 0.082        | 0.195        | 0.121        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 25    | 0.035        | 0.210        | 0.112        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 30    | 0.019        | 0.199        | 0.116        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 89    | 0.009        | 0.206        | 0.114        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 14    | 0.031        | 0.049        | 0.041        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 463   | 0.010        | 0.220        | 0.114        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 17    | 0.016        | 0.152        | 0.115        |
|      |              |      |              |              |       |              |              |              |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 3     | 0.137        | 0.198        | 0.172        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 10    | 0.022        | 0.050        | 0.039        |

### **Fox 3-6 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 518   | 0.044        | 0.276        | 0.136        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1726  | 0.066        | 0.198        | 0.142        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 391   | 0.055        | 0.286        | 0.139        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 495   | 0.047        | 0.281        | 0.136        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 234   | 0.056        | 0.185        | 0.134        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 3092  | 0.061        | 0.185        | 0.141        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 6971  | 0.005        | 0.051        | 0.040        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 30    | 0.056        | 0.212        | 0.120        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Colt 1873    | 8     | 0.016        | 0.048        | 0.039        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 45    | 0.048        | 0.187        | 0.109        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 15    | 0.026        | 0.049        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 7     | 0.026        | 0.046        | 0.035        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 199   | 0.014        | 0.215        | 0.107        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 80    | 0.028        | 0.179        | 0.110        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 22    | 0.076        | 0.208        | 0.115        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 8     | 0.063        | 0.115        | 0.103        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 32    | 0.057        | 0.194        | 0.114        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 1     | 0.040        | 0.040        | 0.040        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 3     | 0.031        | 0.047        | 0.040        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 6     | 0.040        | 0.050        | 0.043        |

### **Fox 3-7 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 495   | 0.066        | 0.197        | 0.133        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1772  | 0.055        | 0.215        | 0.143        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2973  | 0.080        | 0.189        | 0.136        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 244   | 0.066        | 0.209        | 0.133        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 410   | 0.057        | 0.206        | 0.137        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 519   | 0.058        | 0.185        | 0.128        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5967  | 0.001        | 0.051        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 64    | 0.018        | 0.198        | 0.115        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 76    | 0.063        | 0.191        | 0.113        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 31    | 0.036        | 0.189        | 0.097        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 20    | 0.023        | 0.050        | 0.039        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 3     | 0.024        | 0.045        | 0.038        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 31    | 0.015        | 0.168        | 0.104        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 316   | 0.005        | 0.274        | 0.115        |

|   |              |   |              |             |    |       |       |       |
|---|--------------|---|--------------|-------------|----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Sha | Springfield | 32 | 0.017 | 0.155 | 0.100 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield | 14 | 0.091 | 0.160 | 0.122 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Colt 1873   | 4  | 0.025 | 0.047 | 0.036 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Colt 1873   | 9  | 0.010 | 0.033 | 0.019 |
| 2 | Cav w/Spring | 1 | Indian w/Bow | Colt 1873   | 12 | 0.006 | 0.025 | 0.015 |

### **Fox 3-8 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2734  | 0.080     | 0.185     | 0.137     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1851  | 0.063     | 0.203     | 0.143     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 531   | 0.049     | 0.185     | 0.130     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 422   | 0.063     | 0.194     | 0.135     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 489   | 0.051     | 0.185     | 0.132     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 239   | 0.062     | 0.195     | 0.134     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5771  | 0.003     | 0.051     | 0.038     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 70    | 0.011     | 0.277     | 0.111     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 19    | 0.018     | 0.246     | 0.096     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 137   | 0.006     | 0.269     | 0.099     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Colt 1873    | 14    | 0.022     | 0.050     | 0.038     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 90    | 0.008     | 0.283     | 0.098     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 72    | 0.006     | 0.285     | 0.106     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 21    | 0.007     | 0.048     | 0.033     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 45    | 0.014     | 0.285     | 0.104     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 471   | 0.006     | 0.284     | 0.103     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 16    | 0.006     | 0.045     | 0.034     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 38    | 0.007     | 0.049     | 0.030     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 4     | 0.018     | 0.048     | 0.040     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 9     | 0.041     | 0.051     | 0.046     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 4     | 0.006     | 0.022     | 0.014     |

### **Fox 3-9 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 225   | 0.068     | 0.190     | 0.134     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2712  | 0.063     | 0.185     | 0.136     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 449   | 0.067     | 0.185     | 0.131     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 491   | 0.054     | 0.186     | 0.129     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1678  | 0.057     | 0.195     | 0.141     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 396   | 0.063     | 0.185     | 0.132     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 6427  | 0.005     | 0.051     | 0.038     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 361   | 0.009     | 0.212     | 0.104     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 29    | 0.014     | 0.128     | 0.098     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Colt 1873    | 17    | 0.035     | 0.049     | 0.043     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Colt 1873    | 29    | 0.001     | 0.050     | 0.032     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Colt 1873    | 2     | 0.028     | 0.029     | 0.028     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 62    | 0.009     | 0.129     | 0.101     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 110   | 0.015     | 0.147     | 0.103     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 11    | 0.028     | 0.047     | 0.037     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 14    | 0.063     | 0.192     | 0.109     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 45    | 0.011     | 0.193     | 0.093     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 40    | 0.008     | 0.209     | 0.104     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 26    | 0.012     | 0.050     | 0.030     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 3     | 0.045     | 0.048     | 0.046     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Colt 1873    | 1     | 0.043     | 0.043     | 0.043     |

### **Fox 3-10 Direct Fire Shots**

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 377   | 0.057     | 0.186     | 0.131     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1528  | 0.074     | 0.194     | 0.139     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 434   | 0.057     | 0.190     | 0.128     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 452   | 0.058     | 0.197     | 0.128     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 2645  | 0.056     | 0.194     | 0.134     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 207   | 0.061     | 0.190     | 0.128     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 5771  | 0.001     | 0.051     | 0.039     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 412   | 0.009     | 0.234     | 0.109     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 93    | 0.007     | 0.269     | 0.115     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 30    | 0.024     | 0.262     | 0.103     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 65    | 0.007     | 0.261     | 0.106     |

|   |              |   |              |             |    |       |       |       |
|---|--------------|---|--------------|-------------|----|-------|-------|-------|
| 2 | Cav w/Spring | 1 | Indian w/Smo | Springfield | 51 | 0.018 | 0.255 | 0.105 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Springfield | 43 | 0.012 | 0.250 | 0.098 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield | 14 | 0.041 | 0.198 | 0.107 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Colt 1873   | 6  | 0.016 | 0.042 | 0.027 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Colt 1873   | 3  | 0.021 | 0.023 | 0.022 |
| 2 | Cav w/Spring | 1 | Indian w/Win | Colt 1873   | 3  | 0.019 | 0.044 | 0.036 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Colt 1873   | 2  | 0.020 | 0.023 | 0.022 |
| 2 | Cav w/Spring | 1 | Indian w/Bow | Colt 1873   | 14 | 0.027 | 0.044 | 0.036 |
| 2 | Cav w/Spring | 1 | Indian w/Rif | Colt 1873   | 13 | 0.018 | 0.045 | 0.030 |
| 2 | Cav w/Spring | 1 | Indian w/Sha | Colt 1873   | 1  | 0.005 | 0.005 | 0.005 |

### 3. Gray

#### Gray 3-1 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 274   | 0.063     | 0.301     | 0.154     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 943   | 0.058     | 0.248     | 0.125     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1063  | 0.064     | 0.245     | 0.119     |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 260   | 0.059     | 0.343     | 0.168     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 236   | 0.058     | 0.284     | 0.134     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 129   | 0.060     | 0.326     | 0.161     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 309   | 0.022     | 0.050     | 0.042     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 186   | 0.060     | 0.247     | 0.144     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 42    | 0.061     | 0.250     | 0.146     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 236   | 0.055     | 0.265     | 0.165     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 173   | 0.055     | 0.259     | 0.158     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 171   | 0.062     | 0.256     | 0.157     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 65    | 0.059     | 0.249     | 0.155     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 235   | 0.057     | 0.236     | 0.124     |

#### Gray 3-2 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 241   | 0.055     | 0.278     | 0.141     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1352  | 0.062     | 0.248     | 0.128     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 276   | 0.044     | 0.269     | 0.142     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 308   | 0.052     | 0.262     | 0.140     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 109   | 0.071     | 0.289     | 0.146     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1076  | 0.041     | 0.225     | 0.129     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 304   | 0.020     | 0.050     | 0.040     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 99    | 0.061     | 0.250     | 0.163     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 203   | 0.063     | 0.264     | 0.134     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 97    | 0.077     | 0.270     | 0.158     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 57    | 0.070     | 0.264     | 0.133     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 123   | 0.058     | 0.268     | 0.152     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 28    | 0.081     | 0.265     | 0.155     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 131   | 0.078     | 0.205     | 0.125     |

#### Gray 3-3 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min Range | Max Range | Ave Range |
|------|--------------|------|--------------|--------------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 243   | 0.050     | 0.304     | 0.162     |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 227   | 0.045     | 0.304     | 0.155     |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 877   | 0.051     | 0.249     | 0.113     |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 919   | 0.057     | 0.248     | 0.125     |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 188   | 0.044     | 0.274     | 0.134     |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 107   | 0.072     | 0.289     | 0.148     |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 581   | 0.031     | 0.051     | 0.043     |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 188   | 0.068     | 0.258     | 0.166     |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 158   | 0.062     | 0.236     | 0.159     |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 149   | 0.068     | 0.222     | 0.138     |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 170   | 0.058     | 0.228     | 0.159     |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 49    | 0.073     | 0.222     | 0.147     |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 42    | 0.069     | 0.220     | 0.148     |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 99    | 0.068     | 0.230     | 0.130     |

### Gray 3-4 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1134  | 0.052        | 0.249        | 0.121        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 283   | 0.045        | 0.305        | 0.159        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 252   | 0.025        | 0.300        | 0.149        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 110   | 0.060        | 0.312        | 0.148        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 938   | 0.056        | 0.211        | 0.123        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 219   | 0.052        | 0.278        | 0.138        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 633   | 0.019        | 0.050        | 0.042        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 120   | 0.062        | 0.219        | 0.137        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 165   | 0.045        | 0.216        | 0.127        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 50    | 0.039        | 0.201        | 0.125        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 82    | 0.044        | 0.218        | 0.136        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 100   | 0.062        | 0.245        | 0.152        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 27    | 0.079        | 0.216        | 0.131        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 173   | 0.041        | 0.239        | 0.128        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Colt 1873    | 9     | 0.040        | 0.046        | 0.043        |

### Gray 3-5 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1069  | 0.021        | 0.249        | 0.122        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 263   | 0.061        | 0.322        | 0.146        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 240   | 0.027        | 0.277        | 0.126        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 917   | 0.051        | 0.246        | 0.119        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 282   | 0.045        | 0.308        | 0.153        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 121   | 0.061        | 0.307        | 0.147        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 413   | 0.021        | 0.050        | 0.041        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 37    | 0.072        | 0.214        | 0.124        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 141   | 0.060        | 0.231        | 0.120        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 163   | 0.065        | 0.246        | 0.134        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 165   | 0.061        | 0.195        | 0.110        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 123   | 0.040        | 0.192        | 0.111        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Colt 1873    | 2     | 0.036        | 0.038        | 0.037        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 55    | 0.068        | 0.203        | 0.111        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 286   | 0.062        | 0.236        | 0.115        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Colt 1873    | 1     | 0.037        | 0.037        | 0.037        |

### Gray 3-6 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 267   | 0.062        | 0.284        | 0.139        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 248   | 0.055        | 0.286        | 0.146        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 985   | 0.059        | 0.243        | 0.128        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1074  | 0.036        | 0.248        | 0.119        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 253   | 0.045        | 0.263        | 0.134        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 106   | 0.060        | 0.281        | 0.144        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 225   | 0.045        | 0.051        | 0.047        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 92    | 0.071        | 0.228        | 0.134        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 137   | 0.057        | 0.210        | 0.125        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 43    | 0.082        | 0.199        | 0.126        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 115   | 0.063        | 0.200        | 0.134        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 37    | 0.071        | 0.249        | 0.145        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 153   | 0.079        | 0.200        | 0.130        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 112   | 0.074        | 0.253        | 0.149        |

### Gray 3-7 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo        | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|-------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield | 271   | 0.021        | 0.292        | 0.152        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield | 254   | 0.043        | 0.290        | 0.163        |

|   |              |   |              |              |      |       |       |       |
|---|--------------|---|--------------|--------------|------|-------|-------|-------|
| 1 | Indian w/Hen | 2 | Cav w/Spring | Henry .44 Ca | 942  | 0.047 | 0.250 | 0.125 |
| 1 | Indian w/Win | 2 | Cav w/Spring | Winchester . | 1074 | 0.056 | 0.249 | 0.119 |
| 1 | Indian w/Sha | 2 | Cav w/Spring | Springfield  | 253  | 0.014 | 0.283 | 0.140 |
| 1 | Indian w/Spr | 2 | Cav w/Spring | Springfield  | 124  | 0.041 | 0.293 | 0.153 |
| 1 | Indian w/Bow | 2 | Cav w/Spring | 45CAL        | 254  | 0.025 | 0.050 | 0.042 |
| 2 | Cav w/Spring | 1 | Indian w/Smo | Springfield  | 82   | 0.061 | 0.247 | 0.129 |
| 2 | Cav w/Spring | 1 | Indian w/Win | Springfield  | 146  | 0.063 | 0.205 | 0.116 |
| 2 | Cav w/Spring | 1 | Indian w/Sha | Springfield  | 46   | 0.038 | 0.198 | 0.123 |
| 2 | Cav w/Spring | 1 | Indian w/Rif | Springfield  | 89   | 0.062 | 0.221 | 0.122 |
| 2 | Cav w/Spring | 1 | Indian w/Spr | Springfield  | 22   | 0.064 | 0.230 | 0.136 |
| 2 | Cav w/Spring | 1 | Indian w/Hen | Springfield  | 75   | 0.056 | 0.288 | 0.149 |
| 2 | Cav w/Spring | 1 | Indian w/Bow | Springfield  | 118  | 0.057 | 0.240 | 0.132 |
| 2 | Cav w/Spring | 1 | Indian w/Win | Colt 1873    | 2    | 0.041 | 0.048 | 0.045 |

### Gray 3-8 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 235   | 0.050        | 0.281        | 0.146        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 266   | 0.066        | 0.301        | 0.161        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 946   | 0.048        | 0.260        | 0.116        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 870   | 0.052        | 0.249        | 0.127        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 269   | 0.070        | 0.325        | 0.167        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 107   | 0.048        | 0.309        | 0.154        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 302   | 0.030        | 0.050        | 0.045        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 135   | 0.067        | 0.277        | 0.124        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 46    | 0.066        | 0.282        | 0.128        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 26    | 0.078        | 0.240        | 0.135        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 98    | 0.082        | 0.291        | 0.141        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 97    | 0.070        | 0.297        | 0.150        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 120   | 0.068        | 0.301        | 0.156        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 186   | 0.070        | 0.305        | 0.156        |

### Gray 3-9 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 275   | 0.056        | 0.293        | 0.162        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 984   | 0.053        | 0.248        | 0.130        |
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 1155  | 0.061        | 0.248        | 0.120        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 285   | 0.072        | 0.309        | 0.178        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 259   | 0.061        | 0.291        | 0.140        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 128   | 0.076        | 0.314        | 0.166        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 923   | 0.026        | 0.051        | 0.043        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 109   | 0.082        | 0.282        | 0.159        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 110   | 0.079        | 0.286        | 0.169        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 36    | 0.059        | 0.268        | 0.134        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 129   | 0.058        | 0.273        | 0.144        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 191   | 0.075        | 0.265        | 0.134        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 35    | 0.084        | 0.285        | 0.163        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 185   | 0.089        | 0.296        | 0.197        |

### Gray 3-10 Direct Fire Shots

| Side | Shooter      | Side | Target       | Ammo         | Shots | Min<br>Range | Max<br>Range | Ave<br>Range |
|------|--------------|------|--------------|--------------|-------|--------------|--------------|--------------|
| 1    | Indian w/Win | 2    | Cav w/Spring | Winchester . | 970   | 0.050        | 0.249        | 0.117        |
| 1    | Indian w/Rif | 2    | Cav w/Spring | Springfield  | 228   | 0.062        | 0.269        | 0.129        |
| 1    | Indian w/Smo | 2    | Cav w/Spring | Springfield  | 213   | 0.063        | 0.266        | 0.132        |
| 1    | Indian w/Spr | 2    | Cav w/Spring | Springfield  | 116   | 0.060        | 0.289        | 0.135        |
| 1    | Indian w/Sha | 2    | Cav w/Spring | Springfield  | 226   | 0.058        | 0.258        | 0.124        |
| 1    | Indian w/Hen | 2    | Cav w/Spring | Henry .44 Ca | 1027  | 0.060        | 0.240        | 0.126        |
| 1    | Indian w/Bow | 2    | Cav w/Spring | 45CAL        | 590   | 0.029        | 0.051        | 0.044        |
| 2    | Cav w/Spring | 1    | Indian w/Hen | Springfield  | 142   | 0.055        | 0.266        | 0.146        |
| 2    | Cav w/Spring | 1    | Indian w/Smo | Springfield  | 126   | 0.062        | 0.258        | 0.145        |
| 2    | Cav w/Spring | 1    | Indian w/Rif | Springfield  | 137   | 0.062        | 0.240        | 0.148        |
| 2    | Cav w/Spring | 1    | Indian w/Spr | Springfield  | 43    | 0.059        | 0.263        | 0.145        |
| 2    | Cav w/Spring | 1    | Indian w/Win | Springfield  | 193   | 0.071        | 0.268        | 0.135        |
| 2    | Cav w/Spring | 1    | Indian w/Sha | Springfield  | 63    | 0.066        | 0.273        | 0.151        |
| 2    | Cav w/Spring | 1    | Indian w/Bow | Springfield  | 221   | 0.050        | 0.238        | 0.136        |

## **C. DIRECT FIRE EFFECTS**



The weapons of the entities listed in the JCATS output charts below are abbreviated as follows:

|              |   |                     |       |   |                        |
|--------------|---|---------------------|-------|---|------------------------|
| Bow          | = | Bow & Arrow         | Hen   | = | Henry Repeating Rifle  |
| Smo          | = | Smoothbore          | Win   | = | Winchester Repeating   |
| Muzzleloader |   |                     | Rifle |   |                        |
| Rif          | = | Rifled Muzzleloader | Spr   | = | Springfield 1873 Rifle |
| Sha          | = | Sharp's Rifle       |       |   |                        |

The abbreviations for the listed effects on the target are:

HT - Hit

KK - Kill

SUS - Suppressed

MOB - Mobility Kill

MFP - Mobility & Firepower Kill

FP - Firepower Kill

MS - Miss

TL - Target Lost

The ranges are expressed kilometers. Example: 0.187 = 187 meters

## 1. Ambrose

### Ambrose 3-1 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 258   | 0.086     | 0.187     | 0.150     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 3     | 0.124     | 0.152     | 0.137     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1021  | 0.077     | 0.197     | 0.153     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 204   | 0.079     | 0.187     | 0.152     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1806  | 0.069     | 0.187     | 0.152     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 242   | 0.079     | 0.186     | 0.150     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 116   | 0.081     | 0.185     | 0.151     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 21    | 0.075     | 0.173     | 0.135     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 13    | 0.081     | 0.163     | 0.116     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 56    | 0.090     | 0.186     | 0.149     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 24    | 0.074     | 0.177     | 0.116     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 5     | 0.079     | 0.184     | 0.138     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 51    | 0.077     | 0.176     | 0.130     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 72    | 0.075     | 0.179     | 0.132     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 8     | 0.103     | 0.182     | 0.156     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 35    | 0.069     | 0.185     | 0.152     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 24    | 0.098     | 0.180     | 0.149     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 14    | 0.088     | 0.176     | 0.117     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 394   | 0.021     | 0.069     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 78    | 0.030     | 0.062     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 9     | 0.024     | 0.045     | 0.038     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 1     | 0.039     | 0.039     | 0.039     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 7     | 0.074     | 0.172     | 0.146     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 5     | 0.082     | 0.155     | 0.113     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 12    | 0.074     | 0.186     | 0.143     |

### Ambrose 3-1 Direct Fire Effects (con't)

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 34    | 0.083     | 0.188     | 0.161     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 7     | 0.038     | 0.049     | 0.045     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 8     | 0.030     | 0.045     | 0.038     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 7     | 0.040     | 0.050     | 0.044     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 16    | 0.078     | 0.164     | 0.113     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 6     | 0.142     | 0.177     | 0.155     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 6     | 0.081     | 0.182     | 0.134     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 8     | 0.109     | 0.184     | 0.141     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 1     | 0.176     | 0.176     | 0.176     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 1     | 0.119     | 0.119     | 0.119     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 5     | 0.100     | 0.159     | 0.122     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 6     | 0.087     | 0.173     | 0.127     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 1598  | 0.035     | 0.343     | 0.107     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 74    | 0.037     | 0.360     | 0.106     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 106   | 0.044     | 0.344     | 0.112     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 521   | 0.038     | 0.349     | 0.105     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP    | 3     | 0.043     | 0.057     | 0.050     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | TL     | 61    | 0.047     | 0.364     | 0.133     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | KK     | 26    | 0.037     | 0.050     | 0.044     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MS     | 93    | 0.038     | 0.050     | 0.046     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB    | 3     | 0.043     | 0.050     | 0.047     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | TL     | 5     | 0.041     | 0.049     | 0.045     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | NE     | 2     | 0.045     | 0.047     | 0.046     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 47    | 0.076     | 0.392     | 0.165     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | DUD    | 3     | 0.095     | 0.180     | 0.125     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 48    | 0.047     | 0.356     | 0.155     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 45    | 0.090     | 0.379     | 0.186     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 56    | 0.056     | 0.368     | 0.181     |
| 2    | Cav w/Spring | Indian w/Sha | Colt 1873    | KK     | 1     | 0.021     | 0.021     | 0.021     |
| 2    | Cav w/Spring | Indian w/Smo | Colt 1873    | KK     | 1     | 0.007     | 0.007     | 0.007     |
| 2    | Cav w/Spring | Indian w/Win | Colt 1873    | KK     | 1     | 0.044     | 0.044     | 0.044     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 31    | 0.049     | 0.371     | 0.225     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | SUS    | 3     | 0.057     | 0.346     | 0.245     |
| 2    | Cav w/Spring | Indian w/Rif | Colt 1873    | MS     | 1     | 0.034     | 0.034     | 0.034     |
| 2    | Cav w/Spring | Indian w/Rif | Colt 1873    | KK     | 1     | 0.038     | 0.038     | 0.038     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 27    | 0.060     | 0.367     | 0.256     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 13    | 0.082     | 0.333     | 0.188     |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MS  | 13 | 0.080 | 0.363 | 0.166 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 9  | 0.091 | 0.346 | 0.230 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 12 | 0.094 | 0.395 | 0.289 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 35 | 0.081 | 0.386 | 0.232 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 26 | 0.116 | 0.377 | 0.279 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | DUD | 2  | 0.165 | 0.332 | 0.249 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | TL  | 2  | 0.096 | 0.097 | 0.096 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 15 | 0.096 | 0.339 | 0.284 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 6  | 0.094 | 0.354 | 0.291 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 6  | 0.085 | 0.381 | 0.250 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 1  | 0.091 | 0.091 | 0.091 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 13 | 0.091 | 0.365 | 0.316 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 3  | 0.102 | 0.341 | 0.198 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | TL  | 5  | 0.121 | 0.342 | 0.287 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 5  | 0.299 | 0.328 | 0.314 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 5  | 0.283 | 0.370 | 0.319 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | TL  | 2  | 0.326 | 0.327 | 0.327 |

### Ambrose 3-2 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 39    | 0.110     | 0.182     | 0.154     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1850  | 0.070     | 0.185     | 0.147     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 250   | 0.079     | 0.185     | 0.142     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 242   | 0.094     | 0.186     | 0.148     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 33    | 0.105     | 0.184     | 0.150     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 16    | 0.085     | 0.181     | 0.115     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 59    | 0.071     | 0.181     | 0.129     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 265   | 0.077     | 0.185     | 0.145     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 9     | 0.107     | 0.181     | 0.147     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1251  | 0.065     | 0.189     | 0.148     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 128   | 0.073     | 0.186     | 0.146     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 22    | 0.091     | 0.164     | 0.120     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 74    | 0.074     | 0.182     | 0.145     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 51    | 0.078     | 0.179     | 0.125     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 7     | 0.126     | 0.179     | 0.149     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 22    | 0.090     | 0.166     | 0.126     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 11    | 0.111     | 0.183     | 0.159     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 8     | 0.091     | 0.153     | 0.128     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 28    | 0.071     | 0.182     | 0.139     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 23    | 0.086     | 0.162     | 0.116     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 6     | 0.104     | 0.174     | 0.139     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 375   | 0.024     | 0.052     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 57    | 0.028     | 0.056     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 6     | 0.031     | 0.041     | 0.037     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 12    | 0.023     | 0.049     | 0.040     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 3     | 0.030     | 0.045     | 0.038     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 6     | 0.116     | 0.183     | 0.153     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 4     | 0.040     | 0.047     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 1     | 0.040     | 0.040     | 0.040     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 6     | 0.134     | 0.184     | 0.162     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 5     | 0.105     | 0.167     | 0.130     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 8     | 0.091     | 0.170     | 0.116     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 16    | 0.088     | 0.151     | 0.112     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 1     | 0.099     | 0.099     | 0.099     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 2     | 0.111     | 0.177     | 0.144     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 1     | 0.105     | 0.105     | 0.105     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 1373  | 0.037     | 0.358     | 0.110     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 516   | 0.048     | 0.364     | 0.107     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 76    | 0.042     | 0.362     | 0.116     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 83    | 0.067     | 0.367     | 0.122     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MS     | 95    | 0.029     | 0.051     | 0.043     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | TL     | 10    | 0.032     | 0.050     | 0.045     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | TL     | 54    | 0.050     | 0.341     | 0.134     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP    | 9     | 0.031     | 0.051     | 0.043     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | KK     | 26    | 0.031     | 0.050     | 0.042     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | NE     | 5     | 0.031     | 0.050     | 0.043     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 61    | 0.044     | 0.371     | 0.218     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 44    | 0.072     | 0.369     | 0.195     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 37    | 0.039     | 0.347     | 0.155     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 48    | 0.045     | 0.360     | 0.163     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 17    | 0.091     | 0.321     | 0.175     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 39    | 0.039     | 0.357     | 0.215     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 60    | 0.045     | 0.341     | 0.189     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 35    | 0.040     | 0.368     | 0.157     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | KK     | 18    | 0.047     | 0.351     | 0.190     |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 20 | 0.041 | 0.341 | 0.243 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 2  | 0.091 | 0.226 | 0.159 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 9  | 0.043 | 0.363 | 0.208 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 5  | 0.087 | 0.341 | 0.240 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 22 | 0.066 | 0.333 | 0.206 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MS  | 12 | 0.042 | 0.364 | 0.224 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 3  | 0.119 | 0.336 | 0.261 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 2  | 0.103 | 0.159 | 0.131 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | TL  | 2  | 0.080 | 0.087 | 0.084 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 9  | 0.044 | 0.366 | 0.240 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 16 | 0.042 | 0.359 | 0.283 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 2  | 0.086 | 0.111 | 0.099 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 32 | 0.041 | 0.386 | 0.221 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 5  | 0.075 | 0.333 | 0.251 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | DUD | 1  | 0.095 | 0.095 | 0.095 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | TL  | 1  | 0.318 | 0.318 | 0.318 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 1  | 0.339 | 0.339 | 0.339 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 1  | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | TL  | 1  | 0.332 | 0.332 | 0.332 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 1  | 0.021 | 0.021 | 0.021 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MS  | 1  | 0.042 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MS  | 3  | 0.045 | 0.047 | 0.046 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | MS  | 2  | 0.042 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | KK  | 1  | 0.042 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 2  | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | NE  | 1  | 0.038 | 0.038 | 0.038 |

### Ambrose 3-3 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1458  | 0.062     | 0.185     | 0.152     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 227   | 0.067     | 0.186     | 0.146     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 218   | 0.081     | 0.195     | 0.149     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 184   | 0.076     | 0.185     | 0.148     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 761   | 0.074     | 0.193     | 0.150     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 19    | 0.093     | 0.180     | 0.124     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 103   | 0.079     | 0.186     | 0.152     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 18    | 0.102     | 0.185     | 0.139     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 21    | 0.079     | 0.174     | 0.122     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 42    | 0.073     | 0.184     | 0.142     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 83    | 0.068     | 0.181     | 0.123     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 9     | 0.080     | 0.155     | 0.116     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 13    | 0.081     | 0.165     | 0.129     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 32    | 0.086     | 0.184     | 0.146     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 20    | 0.099     | 0.189     | 0.161     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 5     | 0.096     | 0.178     | 0.152     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 3     | 0.146     | 0.164     | 0.157     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 343   | 0.000     | 0.062     | 0.041     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 63    | 0.009     | 0.061     | 0.041     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 14    | 0.012     | 0.050     | 0.039     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 6     | 0.007     | 0.046     | 0.034     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 3     | 0.039     | 0.041     | 0.039     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 1     | 0.041     | 0.041     | 0.041     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 4     | 0.120     | 0.179     | 0.161     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 37    | 0.070     | 0.173     | 0.115     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 5     | 0.080     | 0.162     | 0.115     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 16    | 0.068     | 0.144     | 0.106     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 3     | 0.098     | 0.156     | 0.137     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 3     | 0.108     | 0.110     | 0.109     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 5     | 0.024     | 0.049     | 0.036     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 11    | 0.084     | 0.179     | 0.132     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 11    | 0.089     | 0.182     | 0.150     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 8     | 0.100     | 0.169     | 0.143     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 8     | 0.101     | 0.166     | 0.127     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 4     | 0.140     | 0.176     | 0.162     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 2     | 0.079     | 0.085     | 0.082     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 1396  | 0.034     | 0.327     | 0.108     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 72    | 0.043     | 0.340     | 0.162     |

|   |              |              |             |     |     |       |       |       |
|---|--------------|--------------|-------------|-----|-----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 51  | 0.034 | 0.348 | 0.150 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MS  | 50  | 0.047 | 0.328 | 0.162 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MS  | 54  | 0.061 | 0.317 | 0.165 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MS  | 42  | 0.048 | 0.329 | 0.181 |
| 2 | Cav w/Spring | Indian w/Sh  | Springfield | MS  | 17  | 0.086 | 0.316 | 0.143 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MS  | 5   | 0.101 | 0.214 | 0.145 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 56  | 0.037 | 0.321 | 0.131 |
| 2 | Cav w/Spring | Indian w/Sh  | Springfield | SUS | 5   | 0.097 | 0.315 | 0.238 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | SUS | 89  | 0.048 | 0.310 | 0.112 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 12  | 0.050 | 0.314 | 0.168 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | KK  | 520 | 0.037 | 0.312 | 0.105 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 60  | 0.037 | 0.316 | 0.130 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 6   | 0.113 | 0.322 | 0.222 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 63  | 0.047 | 0.305 | 0.107 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MS  | 86  | 0.034 | 0.053 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | TL  | 58  | 0.045 | 0.318 | 0.117 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | TL  | 4   | 0.039 | 0.048 | 0.043 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | FP  | 1   | 0.048 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 6   | 0.037 | 0.049 | 0.046 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | NE  | 4   | 0.038 | 0.048 | 0.042 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 27  | 0.020 | 0.050 | 0.042 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MS  | 4   | 0.024 | 0.043 | 0.038 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | KK  | 2   | 0.026 | 0.043 | 0.034 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 2   | 0.036 | 0.045 | 0.041 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 5   | 0.052 | 0.309 | 0.181 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 16  | 0.040 | 0.315 | 0.119 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | KK  | 50  | 0.040 | 0.333 | 0.141 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 4   | 0.047 | 0.121 | 0.093 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 5   | 0.052 | 0.297 | 0.163 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | TL  | 3   | 0.101 | 0.312 | 0.240 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 13  | 0.042 | 0.314 | 0.159 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 17  | 0.081 | 0.339 | 0.266 |
| 2 | Cav w/Spring | Indian w/Sh  | Springfield | KK  | 16  | 0.039 | 0.316 | 0.152 |
| 2 | Cav w/Spring | Indian w/Sh  | Springfield | DUD | 2   | 0.103 | 0.309 | 0.206 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | TL  | 3   | 0.112 | 0.310 | 0.242 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 12  | 0.044 | 0.329 | 0.193 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 2   | 0.035 | 0.038 | 0.037 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MOB | 1   | 0.034 | 0.034 | 0.034 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MS  | 4   | 0.045 | 0.047 | 0.047 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 2   | 0.034 | 0.041 | 0.038 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 3   | 0.035 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | NE  | 1   | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 2   | 0.054 | 0.315 | 0.184 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | FP  | 1   | 0.045 | 0.045 | 0.045 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 2   | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MFP | 1   | 0.041 | 0.041 | 0.041 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | KK  | 1   | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | NE  | 1   | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 1   | 0.086 | 0.086 | 0.086 |

### Ambrose 3-4 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 262   | 0.084     | 0.191     | 0.150     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 147   | 0.084     | 0.185     | 0.146     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 298   | 0.080     | 0.185     | 0.149     |
| 1    | Indian w/Sh  | Cav w/Spring | Springfield  | MS     | 301   | 0.078     | 0.185     | 0.143     |
| 1    | Indian w/Sh  | Cav w/Spring | Springfield  | KK     | 20    | 0.077     | 0.159     | 0.116     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1421  | 0.078     | 0.193     | 0.155     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1918  | 0.082     | 0.186     | 0.155     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 12    | 0.099     | 0.161     | 0.135     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 57    | 0.080     | 0.179     | 0.137     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 30    | 0.117     | 0.184     | 0.157     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 27    | 0.077     | 0.164     | 0.107     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 26    | 0.077     | 0.171     | 0.110     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 42    | 0.091     | 0.178     | 0.130     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 55    | 0.103     | 0.185     | 0.156     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 3     | 0.135     | 0.179     | 0.154     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 40    | 0.106     | 0.184     | 0.152     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 36    | 0.101     | 0.184     | 0.155     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 353   | 0.029     | 0.060     | 0.044     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 49    | 0.035     | 0.049     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 2     | 0.039     | 0.049     | 0.044     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 11    | 0.031     | 0.049     | 0.040     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 3     | 0.031     | 0.049     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 2     | 0.048     | 0.049     | 0.049     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 9    | 0.032 | 0.048 | 0.042 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 7    | 0.101 | 0.183 | 0.142 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | DUD | 16   | 0.080 | 0.184 | 0.145 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 10   | 0.105 | 0.183 | 0.146 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 8    | 0.133 | 0.184 | 0.151 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 8    | 0.099 | 0.184 | 0.163 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 4    | 0.097 | 0.184 | 0.146 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 10   | 0.099 | 0.167 | 0.139 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | TL  | 7    | 0.093 | 0.184 | 0.140 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 2    | 0.090 | 0.109 | 0.100 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | SUS | 5    | 0.093 | 0.104 | 0.098 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 5    | 0.099 | 0.148 | 0.125 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 5    | 0.070 | 0.148 | 0.105 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 11   | 0.078 | 0.140 | 0.100 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 1505 | 0.033 | 0.253 | 0.105 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 74   | 0.038 | 0.137 | 0.098 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 95   | 0.055 | 0.216 | 0.107 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 519  | 0.018 | 0.234 | 0.102 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 77   | 0.023 | 0.050 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 3    | 0.047 | 0.050 | 0.048 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | TL  | 56   | 0.048 | 0.149 | 0.108 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 38   | 0.011 | 0.057 | 0.042 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP | 5    | 0.041 | 0.049 | 0.046 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | TL  | 3    | 0.040 | 0.050 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | FP  | 1    | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 57   | 0.016 | 0.220 | 0.120 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 52   | 0.042 | 0.259 | 0.137 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 17   | 0.090 | 0.199 | 0.131 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | MS  | 14   | 0.057 | 0.211 | 0.105 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 47   | 0.039 | 0.238 | 0.120 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 49   | 0.039 | 0.247 | 0.126 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | KK  | 4    | 0.022 | 0.046 | 0.033 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 27   | 0.017 | 0.245 | 0.063 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 2    | 0.028 | 0.046 | 0.037 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 24   | 0.020 | 0.194 | 0.096 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 7    | 0.020 | 0.136 | 0.080 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 5    | 0.036 | 0.181 | 0.092 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 42   | 0.035 | 0.165 | 0.085 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 7    | 0.038 | 0.217 | 0.107 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 7    | 0.037 | 0.099 | 0.064 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 25   | 0.028 | 0.140 | 0.070 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | DUD | 1    | 0.062 | 0.062 | 0.062 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | DUD | 1    | 0.067 | 0.067 | 0.067 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | KK  | 11   | 0.037 | 0.228 | 0.096 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 2    | 0.108 | 0.128 | 0.118 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 2    | 0.094 | 0.138 | 0.116 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 2    | 0.093 | 0.093 | 0.093 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 2    | 0.087 | 0.096 | 0.091 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | TL  | 1    | 0.092 | 0.092 | 0.092 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | TL  | 1    | 0.122 | 0.122 | 0.122 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 5    | 0.043 | 0.129 | 0.087 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | SUS | 2    | 0.037 | 0.102 | 0.069 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | KK  | 1    | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | MS  | 3    | 0.036 | 0.036 | 0.036 |

### Ambrose 3-5 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 64    | 0.066     | 0.179     | 0.135     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1865  | 0.070     | 0.185     | 0.154     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 261   | 0.082     | 0.214     | 0.149     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1376  | 0.075     | 0.220     | 0.157     |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | MS     | 317   | 0.080     | 0.186     | 0.145     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 282   | 0.071     | 0.185     | 0.147     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 7     | 0.116     | 0.184     | 0.154     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 6     | 0.091     | 0.167     | 0.142     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 33    | 0.081     | 0.166     | 0.122     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 5     | 0.105     | 0.147     | 0.121     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 12    | 0.089     | 0.185     | 0.161     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 154   | 0.079     | 0.214     | 0.148     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 65    | 0.109     | 0.185     | 0.154     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 12    | 0.081     | 0.169     | 0.141     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 38    | 0.079     | 0.180     | 0.129     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 46    | 0.103     | 0.213     | 0.156     |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | DUD    | 10    | 0.107     | 0.183     | 0.152     |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | KK     | 26    | 0.086     | 0.173     | 0.114     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 15   | 0.134 | 0.179 | 0.165 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 994  | 0.019 | 0.053 | 0.039 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 16   | 0.018 | 0.050 | 0.039 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 86   | 0.022 | 0.050 | 0.041 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 15   | 0.019 | 0.047 | 0.035 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 2    | 0.039 | 0.045 | 0.042 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | SUS | 18   | 0.074 | 0.173 | 0.140 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 5    | 0.093 | 0.181 | 0.144 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 14   | 0.024 | 0.048 | 0.037 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | FP  | 1    | 0.032 | 0.032 | 0.032 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 2    | 0.089 | 0.184 | 0.136 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 5    | 0.095 | 0.158 | 0.129 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 5    | 0.125 | 0.215 | 0.173 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 15   | 0.110 | 0.185 | 0.144 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 4    | 0.124 | 0.184 | 0.156 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 11   | 0.080 | 0.167 | 0.123 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 12   | 0.083 | 0.146 | 0.109 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 4    | 0.098 | 0.148 | 0.111 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 2    | 0.115 | 0.168 | 0.142 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 1549 | 0.032 | 0.362 | 0.110 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 79   | 0.044 | 0.163 | 0.104 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 101  | 0.046 | 0.357 | 0.118 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 101  | 0.037 | 0.058 | 0.046 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 523  | 0.037 | 0.362 | 0.109 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 4    | 0.039 | 0.047 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 23   | 0.038 | 0.052 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP | 7    | 0.040 | 0.049 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | TL  | 5    | 0.039 | 0.047 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | FP  | 2    | 0.039 | 0.045 | 0.042 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB | 1    | 0.042 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 87   | 0.094 | 0.416 | 0.199 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 52   | 0.044 | 0.398 | 0.153 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 50   | 0.067 | 0.355 | 0.174 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 61   | 0.077 | 0.391 | 0.163 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | MS  | 4    | 0.041 | 0.050 | 0.047 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | KK  | 4    | 0.028 | 0.045 | 0.040 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | MS  | 3    | 0.036 | 0.050 | 0.043 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | TL  | 56   | 0.071 | 0.360 | 0.140 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | NE  | 1    | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 48   | 0.041 | 0.388 | 0.195 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | KK  | 1    | 0.012 | 0.012 | 0.012 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 44   | 0.041 | 0.374 | 0.154 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 19   | 0.042 | 0.335 | 0.166 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 40   | 0.042 | 0.396 | 0.221 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 54   | 0.043 | 0.347 | 0.142 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 8    | 0.098 | 0.363 | 0.218 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 3    | 0.096 | 0.338 | 0.214 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 12   | 0.093 | 0.324 | 0.174 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 27   | 0.043 | 0.397 | 0.219 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 17   | 0.081 | 0.398 | 0.193 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 16   | 0.042 | 0.334 | 0.193 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 19   | 0.042 | 0.366 | 0.242 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 3    | 0.101 | 0.351 | 0.190 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | TL  | 1    | 0.098 | 0.098 | 0.098 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | KK  | 1    | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 8    | 0.043 | 0.330 | 0.200 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | MFP | 1    | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 1    | 0.096 | 0.096 | 0.096 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | TL  | 2    | 0.101 | 0.329 | 0.215 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 13   | 0.293 | 0.387 | 0.335 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | DUD | 1    | 0.352 | 0.352 | 0.352 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 2    | 0.044 | 0.046 | 0.045 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | FP  | 1    | 0.046 | 0.046 | 0.046 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | KK  | 1    | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 1    | 0.300 | 0.300 | 0.300 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 2    | 0.043 | 0.074 | 0.058 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | DUD | 1    | 0.068 | 0.068 | 0.068 |

### Ambrose 3-6 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1874  | 0.069     | 0.186     | 0.149     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 224   | 0.078     | 0.185     | 0.150     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1089  | 0.073     | 0.197     | 0.155     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 10    | 0.087     | 0.183     | 0.141     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 259   | 0.076     | 0.185     | 0.146     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Win | Cav w/Spring | Winchester . | SUS | 17   | 0.093 | 0.173 | 0.134 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MS  | 291  | 0.083 | 0.184 | 0.141 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 22   | 0.084 | 0.163 | 0.120 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 34   | 0.092 | 0.187 | 0.152 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 41   | 0.087 | 0.192 | 0.146 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 11   | 0.126 | 0.184 | 0.160 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 11   | 0.090 | 0.184 | 0.151 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 7    | 0.091 | 0.151 | 0.111 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 6    | 0.099 | 0.184 | 0.159 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 58   | 0.085 | 0.177 | 0.125 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 10   | 0.089 | 0.182 | 0.134 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MS  | 125  | 0.088 | 0.185 | 0.146 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 73   | 0.069 | 0.184 | 0.146 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | KK  | 54   | 0.077 | 0.178 | 0.128 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 28   | 0.114 | 0.179 | 0.146 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 21   | 0.080 | 0.177 | 0.112 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 830  | 0.017 | 0.061 | 0.039 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 75   | 0.019 | 0.050 | 0.042 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 23   | 0.023 | 0.049 | 0.037 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 16   | 0.021 | 0.047 | 0.037 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | FP  | 2    | 0.041 | 0.044 | 0.043 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 2    | 0.037 | 0.037 | 0.037 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 19   | 0.027 | 0.050 | 0.040 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 5    | 0.092 | 0.169 | 0.120 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 4    | 0.080 | 0.111 | 0.094 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 18   | 0.079 | 0.165 | 0.115 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 7    | 0.106 | 0.183 | 0.156 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 3    | 0.103 | 0.184 | 0.136 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 9    | 0.108 | 0.176 | 0.149 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 5    | 0.133 | 0.182 | 0.153 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 5    | 0.093 | 0.166 | 0.118 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 1    | 0.157 | 0.157 | 0.157 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 1335 | 0.033 | 0.375 | 0.109 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 48   | 0.050 | 0.177 | 0.097 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 103  | 0.049 | 0.362 | 0.126 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 522  | 0.033 | 0.364 | 0.108 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 26   | 0.034 | 0.050 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 95   | 0.034 | 0.057 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP | 2    | 0.049 | 0.050 | 0.049 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 2    | 0.040 | 0.045 | 0.042 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | TL  | 2    | 0.037 | 0.049 | 0.043 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB | 1    | 0.047 | 0.047 | 0.047 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 56   | 0.035 | 0.397 | 0.186 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 38   | 0.089 | 0.378 | 0.205 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 32   | 0.016 | 0.384 | 0.230 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 40   | 0.076 | 0.367 | 0.187 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 2    | 0.114 | 0.332 | 0.223 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 34   | 0.038 | 0.372 | 0.219 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 2    | 0.119 | 0.348 | 0.234 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 12   | 0.088 | 0.368 | 0.246 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | KK  | 1    | 0.020 | 0.020 | 0.020 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 36   | 0.038 | 0.402 | 0.281 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | KK  | 1    | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 7    | 0.063 | 0.360 | 0.225 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 54   | 0.061 | 0.394 | 0.221 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 9    | 0.085 | 0.353 | 0.225 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 30   | 0.069 | 0.387 | 0.277 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 9    | 0.108 | 0.390 | 0.237 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | TL  | 76   | 0.076 | 0.377 | 0.139 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 12   | 0.109 | 0.386 | 0.311 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 15   | 0.093 | 0.385 | 0.269 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 11   | 0.101 | 0.380 | 0.302 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 4    | 0.092 | 0.360 | 0.220 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | TL  | 1    | 0.093 | 0.093 | 0.093 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 10   | 0.125 | 0.392 | 0.324 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 2    | 0.093 | 0.355 | 0.224 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 5    | 0.105 | 0.330 | 0.276 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | TL  | 2    | 0.112 | 0.341 | 0.226 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 3    | 0.290 | 0.320 | 0.310 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | TL  | 1    | 0.315 | 0.315 | 0.315 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | DUD | 1    | 0.364 | 0.364 | 0.364 |

### Ambrose 3-7 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 993   | 0.065     | 0.220     | 0.156     |



|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MS  | 193  | 0.069 | 0.213 | 0.154 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 5    | 0.107 | 0.184 | 0.133 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MS  | 1479 | 0.058 | 0.195 | 0.153 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MS  | 228  | 0.069 | 0.201 | 0.149 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MS  | 103  | 0.076 | 0.206 | 0.150 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 49   | 0.072 | 0.180 | 0.127 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 3    | 0.085 | 0.145 | 0.118 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 5    | 0.145 | 0.184 | 0.166 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | KK  | 76   | 0.064 | 0.173 | 0.120 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 19   | 0.058 | 0.184 | 0.133 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MS  | 196  | 0.078 | 0.195 | 0.148 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 3    | 0.096 | 0.164 | 0.137 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | SUS | 11   | 0.104 | 0.161 | 0.135 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 33   | 0.084 | 0.187 | 0.155 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 13   | 0.074 | 0.157 | 0.107 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 23   | 0.081 | 0.162 | 0.106 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 9    | 0.134 | 0.184 | 0.152 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 44   | 0.072 | 0.187 | 0.152 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 14   | 0.079 | 0.161 | 0.128 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 24   | 0.102 | 0.222 | 0.154 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 16   | 0.091 | 0.173 | 0.121 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 528  | 0.012 | 0.052 | 0.040 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 58   | 0.027 | 0.050 | 0.041 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 8    | 0.027 | 0.045 | 0.036 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 15   | 0.015 | 0.048 | 0.038 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 3    | 0.035 | 0.047 | 0.041 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 19   | 0.027 | 0.042 | 0.035 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | FP  | 2    | 0.041 | 0.044 | 0.043 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 2    | 0.144 | 0.181 | 0.163 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 7    | 0.100 | 0.180 | 0.147 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 7    | 0.106 | 0.201 | 0.160 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 4    | 0.103 | 0.179 | 0.139 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 8    | 0.095 | 0.168 | 0.113 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 2    | 0.114 | 0.151 | 0.133 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 1    | 0.138 | 0.138 | 0.138 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 1312 | 0.031 | 0.366 | 0.109 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 526  | 0.037 | 0.362 | 0.108 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 68   | 0.041 | 0.324 | 0.110 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 106  | 0.033 | 0.051 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 121  | 0.052 | 0.352 | 0.124 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | TL  | 76   | 0.037 | 0.362 | 0.176 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP | 4    | 0.045 | 0.050 | 0.049 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | FP  | 2    | 0.046 | 0.050 | 0.048 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 21   | 0.035 | 0.049 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 7    | 0.038 | 0.050 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | TL  | 2    | 0.046 | 0.048 | 0.047 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 59   | 0.047 | 0.357 | 0.227 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 62   | 0.078 | 0.348 | 0.212 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 20   | 0.045 | 0.365 | 0.204 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 53   | 0.042 | 0.363 | 0.232 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 7    | 0.046 | 0.329 | 0.198 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 78   | 0.034 | 0.347 | 0.177 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 1    | 0.025 | 0.025 | 0.025 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | KK  | 2    | 0.029 | 0.044 | 0.037 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 16   | 0.038 | 0.342 | 0.190 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 27   | 0.040 | 0.349 | 0.169 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 60   | 0.043 | 0.353 | 0.175 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 69   | 0.011 | 0.371 | 0.189 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 50   | 0.043 | 0.369 | 0.221 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 59   | 0.042 | 0.366 | 0.202 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 19   | 0.082 | 0.349 | 0.241 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 4    | 0.109 | 0.320 | 0.264 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 5    | 0.088 | 0.360 | 0.230 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | TL  | 3    | 0.102 | 0.328 | 0.252 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 20   | 0.054 | 0.357 | 0.263 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 9    | 0.071 | 0.356 | 0.203 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 28   | 0.054 | 0.341 | 0.276 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 29   | 0.044 | 0.350 | 0.279 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | TL  | 8    | 0.295 | 0.359 | 0.321 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | TL  | 2    | 0.292 | 0.317 | 0.304 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | TL  | 6    | 0.300 | 0.330 | 0.318 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | TL  | 7    | 0.318 | 0.346 | 0.327 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | MS  | 2    | 0.036 | 0.042 | 0.039 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | KK  | 2    | 0.041 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 17   | 0.045 | 0.340 | 0.283 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | MS  | 3    | 0.043 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 7    | 0.075 | 0.352 | 0.287 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | TL  | 1    | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | DUD | 3    | 0.302 | 0.309 | 0.306 |

|   |              |              |             |     |   |       |       |       |
|---|--------------|--------------|-------------|-----|---|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MS  | 6 | 0.042 | 0.049 | 0.047 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 3 | 0.100 | 0.336 | 0.255 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 2 | 0.045 | 0.049 | 0.047 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | KK  | 3 | 0.041 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 2 | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | KK  | 1 | 0.046 | 0.046 | 0.046 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | NE  | 1 | 0.049 | 0.049 | 0.049 |

### Ambrose 3-8 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 264   | 0.078     | 0.186     | 0.149     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1124  | 0.069     | 0.196     | 0.158     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1509  | 0.072     | 0.185     | 0.158     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 229   | 0.088     | 0.186     | 0.151     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 57    | 0.071     | 0.178     | 0.136     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 126   | 0.080     | 0.185     | 0.149     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 283   | 0.075     | 0.185     | 0.145     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 23    | 0.128     | 0.181     | 0.156     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 8     | 0.112     | 0.184     | 0.159     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 11    | 0.084     | 0.180     | 0.135     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 39    | 0.082     | 0.185     | 0.151     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 43    | 0.102     | 0.183     | 0.156     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 50    | 0.079     | 0.180     | 0.127     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 25    | 0.068     | 0.192     | 0.158     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 3     | 0.123     | 0.162     | 0.145     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 20    | 0.075     | 0.174     | 0.138     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 6     | 0.104     | 0.181     | 0.153     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 20    | 0.083     | 0.183     | 0.121     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 2     | 0.120     | 0.145     | 0.133     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 2     | 0.134     | 0.167     | 0.151     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 324   | 0.029     | 0.052     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 64    | 0.030     | 0.049     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 15    | 0.035     | 0.049     | 0.041     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 5     | 0.032     | 0.048     | 0.043     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 5     | 0.091     | 0.173     | 0.119     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 18    | 0.076     | 0.165     | 0.111     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 1     | 0.039     | 0.039     | 0.039     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 2     | 0.039     | 0.041     | 0.040     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 1     | 0.040     | 0.040     | 0.040     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 8     | 0.105     | 0.179     | 0.148     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 6     | 0.073     | 0.174     | 0.117     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 33    | 0.074     | 0.174     | 0.119     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 7     | 0.137     | 0.169     | 0.156     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 8     | 0.083     | 0.151     | 0.109     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 5     | 0.079     | 0.175     | 0.145     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 6     | 0.090     | 0.139     | 0.115     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 1595  | 0.036     | 0.371     | 0.111     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | KK     | 29    | 0.037     | 0.052     | 0.044     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 521   | 0.043     | 0.373     | 0.109     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 63    | 0.049     | 0.358     | 0.109     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 102   | 0.053     | 0.378     | 0.134     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MS     | 70    | 0.037     | 0.064     | 0.046     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP    | 5     | 0.047     | 0.050     | 0.049     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | FP     | 3     | 0.047     | 0.049     | 0.048     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | NE     | 3     | 0.038     | 0.048     | 0.044     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | TL     | 5     | 0.042     | 0.048     | 0.045     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | TL     | 72    | 0.042     | 0.380     | 0.186     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 72    | 0.042     | 0.381     | 0.221     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 50    | 0.077     | 0.389     | 0.251     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 12    | 0.051     | 0.352     | 0.229     |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB    | 1     | 0.049     | 0.049     | 0.049     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 61    | 0.066     | 0.390     | 0.203     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | DUD    | 3     | 0.082     | 0.326     | 0.213     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 23    | 0.060     | 0.350     | 0.212     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 60    | 0.044     | 0.391     | 0.259     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 57    | 0.035     | 0.370     | 0.222     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 15    | 0.082     | 0.379     | 0.196     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 51    | 0.042     | 0.387     | 0.233     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 57    | 0.042     | 0.383     | 0.208     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 19    | 0.109     | 0.383     | 0.284     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | TL     | 5     | 0.089     | 0.355     | 0.237     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | KK     | 14    | 0.061     | 0.357     | 0.240     |
| 2    | Cav w/Spring | Indian w/Smo | Colt 1873    | MS     | 3     | 0.041     | 0.046     | 0.044     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | KK     | 51    | 0.041     | 0.377     | 0.248     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 20    | 0.044     | 0.393     | 0.274     |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 20 | 0.043 | 0.394 | 0.231 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | FP  | 1  | 0.041 | 0.041 | 0.041 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | TL  | 2  | 0.313 | 0.335 | 0.324 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | TL  | 4  | 0.305 | 0.330 | 0.322 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 22 | 0.290 | 0.353 | 0.321 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 20 | 0.046 | 0.398 | 0.309 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 4  | 0.096 | 0.359 | 0.219 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | TL  | 4  | 0.318 | 0.334 | 0.326 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 1  | 0.323 | 0.323 | 0.323 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | DUD | 3  | 0.088 | 0.334 | 0.251 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 5  | 0.054 | 0.334 | 0.267 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 2  | 0.324 | 0.339 | 0.331 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | TL  | 1  | 0.323 | 0.323 | 0.323 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | TL  | 1  | 0.316 | 0.316 | 0.316 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 1  | 0.357 | 0.357 | 0.357 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MS  | 1  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MFP | 1  | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 2  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | NE  | 1  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 1  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | KK  | 1  | 0.041 | 0.041 | 0.041 |

### Ambrose 3-9 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min<br>Range | Max<br>Range | Avg<br>Range |
|------|--------------|--------------|--------------|--------|-------|--------------|--------------|--------------|
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1124  | 0.069        | 0.194        | 0.151        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 25    | 0.070        | 0.176        | 0.136        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 250   | 0.068        | 0.186        | 0.147        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 230   | 0.074        | 0.185        | 0.149        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 14    | 0.085        | 0.168        | 0.137        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1786  | 0.066        | 0.185        | 0.151        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 30    | 0.096        | 0.189        | 0.146        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 124   | 0.072        | 0.185        | 0.147        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 269   | 0.071        | 0.185        | 0.147        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 65    | 0.073        | 0.178        | 0.127        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 5     | 0.096        | 0.184        | 0.146        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 42    | 0.093        | 0.183        | 0.148        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 33    | 0.067        | 0.177        | 0.145        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 60    | 0.071        | 0.182        | 0.133        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 9     | 0.093        | 0.178        | 0.140        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 25    | 0.091        | 0.181        | 0.150        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 21    | 0.083        | 0.168        | 0.117        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 9     | 0.090        | 0.176        | 0.149        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 290   | 0.033        | 0.061        | 0.044        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 13    | 0.037        | 0.048        | 0.042        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 49    | 0.036        | 0.050        | 0.042        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 13    | 0.080        | 0.161        | 0.110        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 11    | 0.086        | 0.183        | 0.143        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 7     | 0.079        | 0.183        | 0.137        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 9     | 0.071        | 0.182        | 0.151        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 4     | 0.036        | 0.047        | 0.044        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 1     | 0.042        | 0.042        | 0.042        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 2     | 0.040        | 0.047        | 0.043        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 1     | 0.050        | 0.050        | 0.050        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 9     | 0.105        | 0.173        | 0.138        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 5     | 0.127        | 0.178        | 0.159        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 25    | 0.083        | 0.165        | 0.117        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 2     | 0.116        | 0.145        | 0.131        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 3     | 0.090        | 0.137        | 0.109        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 2     | 0.091        | 0.097        | 0.094        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 2     | 0.146        | 0.158        | 0.152        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 1416  | 0.035        | 0.347        | 0.108        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 534   | 0.037        | 0.339        | 0.104        |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 68 | 0.059 | 0.300 | 0.113 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | TL  | 54 | 0.061 | 0.346 | 0.145 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | SUS | 98 | 0.052 | 0.341 | 0.116 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MS  | 71 | 0.035 | 0.050 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 22 | 0.038 | 0.050 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | TL  | 5  | 0.040 | 0.050 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | FP  | 1  | 0.050 | 0.050 | 0.050 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | NE  | 3  | 0.048 | 0.049 | 0.049 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 2  | 0.045 | 0.050 | 0.048 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MOB | 1  | 0.049 | 0.049 | 0.049 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MS  | 53 | 0.049 | 0.382 | 0.182 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MS  | 18 | 0.038 | 0.349 | 0.154 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MS  | 42 | 0.082 | 0.365 | 0.181 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MS  | 43 | 0.045 | 0.352 | 0.174 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MS  | 53 | 0.046 | 0.375 | 0.182 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 3  | 0.172 | 0.188 | 0.181 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 3  | 0.045 | 0.219 | 0.152 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MS  | 5  | 0.134 | 0.332 | 0.219 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | DUD | 2  | 0.120 | 0.124 | 0.122 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 33 | 0.037 | 0.362 | 0.133 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 35 | 0.056 | 0.382 | 0.210 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | KK  | 28 | 0.048 | 0.361 | 0.184 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 10 | 0.094 | 0.349 | 0.278 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 13 | 0.041 | 0.344 | 0.198 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 27 | 0.039 | 0.362 | 0.190 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 4  | 0.130 | 0.322 | 0.266 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 1  | 0.122 | 0.122 | 0.122 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 3  | 0.047 | 0.087 | 0.072 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 7  | 0.054 | 0.375 | 0.289 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 15 | 0.112 | 0.383 | 0.298 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 7  | 0.305 | 0.342 | 0.324 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 3  | 0.045 | 0.316 | 0.223 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 7  | 0.046 | 0.330 | 0.196 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 1  | 0.329 | 0.329 | 0.329 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | TL  | 1  | 0.302 | 0.302 | 0.302 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | TL  | 1  | 0.338 | 0.338 | 0.338 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MS  | 1  | 0.028 | 0.028 | 0.028 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 1  | 0.041 | 0.041 | 0.041 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 1  | 0.041 | 0.041 | 0.041 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MS  | 1  | 0.049 | 0.049 | 0.049 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1  | 0.049 | 0.049 | 0.049 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 1  | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 1  | 0.039 | 0.039 | 0.039 |

### Ambrose 3-10 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 643   | 0.077     | 0.216     | 0.150     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1133  | 0.069     | 0.186     | 0.145     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 146   | 0.083     | 0.211     | 0.149     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 189   | 0.079     | 0.188     | 0.144     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 14    | 0.088     | 0.152     | 0.118     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 195   | 0.077     | 0.185     | 0.143     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 100   | 0.075     | 0.176     | 0.120     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 78    | 0.083     | 0.215     | 0.150     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 49    | 0.087     | 0.171     | 0.130     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 6     | 0.105     | 0.184     | 0.151     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 26    | 0.086     | 0.184     | 0.145     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 26    | 0.120     | 0.183     | 0.157     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 15    | 0.088     | 0.163     | 0.118     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 4     | 0.136     | 0.162     | 0.150     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 31    | 0.076     | 0.180     | 0.138     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 375   | 0.027     | 0.059     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 86    | 0.027     | 0.058     | 0.041     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 8     | 0.031     | 0.048     | 0.041     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 18    | 0.075     | 0.172     | 0.119     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 3     | 0.082     | 0.106     | 0.092     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 46    | 0.083     | 0.184     | 0.144     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 5     | 0.083     | 0.160     | 0.107     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 6     | 0.101     | 0.184     | 0.145     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 5     | 0.122     | 0.185     | 0.154     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 8     | 0.095     | 0.185     | 0.145     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 7     | 0.033     | 0.044     | 0.039     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 2     | 0.032     | 0.039     | 0.036     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 1     | 0.044     | 0.044     | 0.044     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 3     | 0.089     | 0.185     | 0.143     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 1    | 0.127 | 0.127 | 0.127 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 2    | 0.089 | 0.089 | 0.089 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 9    | 0.085 | 0.176 | 0.120 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 6    | 0.099 | 0.142 | 0.112 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 4    | 0.098 | 0.150 | 0.129 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 2    | 0.103 | 0.114 | 0.109 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 1    | 0.101 | 0.101 | 0.101 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 1265 | 0.039 | 0.381 | 0.107 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 60   | 0.052 | 0.372 | 0.113 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 526  | 0.043 | 0.364 | 0.106 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 99   | 0.042 | 0.372 | 0.127 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | TL  | 73   | 0.050 | 0.375 | 0.156 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 81   | 0.035 | 0.051 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 5    | 0.043 | 0.047 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | TL  | 5    | 0.039 | 0.048 | 0.043 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 29   | 0.035 | 0.050 | 0.042 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MFP | 3    | 0.047 | 0.049 | 0.048 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 40   | 0.072 | 0.372 | 0.205 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 50   | 0.039 | 0.393 | 0.209 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 42   | 0.043 | 0.391 | 0.162 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 16   | 0.089 | 0.354 | 0.164 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 43   | 0.088 | 0.395 | 0.221 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 12   | 0.096 | 0.377 | 0.188 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 34   | 0.048 | 0.375 | 0.218 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 32   | 0.058 | 0.388 | 0.218 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 14   | 0.038 | 0.352 | 0.175 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 13   | 0.051 | 0.352 | 0.253 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 36   | 0.044 | 0.335 | 0.187 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 7    | 0.093 | 0.404 | 0.301 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 3    | 0.063 | 0.337 | 0.184 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 35   | 0.046 | 0.359 | 0.180 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 15   | 0.041 | 0.371 | 0.236 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 8    | 0.049 | 0.333 | 0.180 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 4    | 0.070 | 0.359 | 0.215 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 18   | 0.065 | 0.415 | 0.298 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 2    | 0.094 | 0.351 | 0.222 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 2    | 0.109 | 0.407 | 0.258 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 10   | 0.047 | 0.362 | 0.273 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | TL  | 1    | 0.331 | 0.331 | 0.331 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | DUD | 2    | 0.067 | 0.323 | 0.195 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | KK  | 1    | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 1    | 0.045 | 0.045 | 0.045 |

## 2. Fox

### Fox 3-1 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 444   | 0.054     | 0.185     | 0.128     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MFP    | 10    | 0.068     | 0.161     | 0.114     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1673  | 0.065     | 0.194     | 0.143     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2461  | 0.080     | 0.193     | 0.134     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 224   | 0.065     | 0.194     | 0.131     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 455   | 0.034     | 0.185     | 0.130     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 371   | 0.052     | 0.187     | 0.132     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 71    | 0.081     | 0.181     | 0.124     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MOB    | 4     | 0.141     | 0.162     | 0.149     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 18    | 0.066     | 0.177     | 0.130     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | FP     | 1     | 0.140     | 0.140     | 0.140     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 81    | 0.086     | 0.185     | 0.136     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 34    | 0.070     | 0.180     | 0.121     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 1     | 0.128     | 0.128     | 0.128     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 31    | 0.081     | 0.170     | 0.120     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 36    | 0.087     | 0.176     | 0.130     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 41    | 0.065     | 0.191     | 0.127     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 53    | 0.078     | 0.186     | 0.138     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 27    | 0.062     | 0.172     | 0.114     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 18    | 0.076     | 0.180     | 0.119     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 14    | 0.092     | 0.177     | 0.136     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 3     | 0.110     | 0.150     | 0.127     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 6040  | 0.003     | 0.051     | 0.039     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 252   | 0.006     | 0.050     | 0.036     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 60    | 0.009     | 0.046     | 0.032     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 65    | 0.011     | 0.048     | 0.030     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 18    | 0.053     | 0.182     | 0.121     |

|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 10  | 0.080 | 0.162 | 0.124 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 15  | 0.038 | 0.153 | 0.093 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | FP  | 9   | 0.093 | 0.132 | 0.116 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP | 17  | 0.079 | 0.168 | 0.128 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 7   | 0.082 | 0.167 | 0.118 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 21  | 0.059 | 0.177 | 0.122 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MOB | 2   | 0.097 | 0.124 | 0.110 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MOB | 2   | 0.074 | 0.093 | 0.083 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | FP  | 4   | 0.080 | 0.154 | 0.117 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 6   | 0.079 | 0.126 | 0.101 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MFP | 9   | 0.054 | 0.181 | 0.111 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | FP  | 4   | 0.084 | 0.126 | 0.102 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 61  | 0.015 | 0.049 | 0.037 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 15  | 0.047 | 0.157 | 0.106 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 4   | 0.075 | 0.137 | 0.104 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MFP | 8   | 0.076 | 0.166 | 0.131 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 7   | 0.068 | 0.181 | 0.125 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 3   | 0.115 | 0.175 | 0.152 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 17  | 0.109 | 0.176 | 0.146 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 7   | 0.064 | 0.174 | 0.108 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MOB | 2   | 0.081 | 0.111 | 0.096 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | FP  | 2   | 0.081 | 0.176 | 0.129 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 6   | 0.044 | 0.188 | 0.152 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 3   | 0.014 | 0.039 | 0.030 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MOB | 9   | 0.091 | 0.161 | 0.138 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 5   | 0.123 | 0.178 | 0.157 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MFP | 1   | 0.169 | 0.169 | 0.169 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 26  | 0.052 | 0.212 | 0.128 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 63  | 0.048 | 0.144 | 0.113 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 5   | 0.051 | 0.109 | 0.084 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 4   | 0.062 | 0.096 | 0.076 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 87  | 0.038 | 0.132 | 0.106 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MFP | 2   | 0.033 | 0.080 | 0.056 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MS  | 24  | 0.028 | 0.049 | 0.042 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MOB | 2   | 0.049 | 0.055 | 0.052 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | NE  | 2   | 0.036 | 0.046 | 0.041 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | KK  | 2   | 0.039 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | MFP | 1   | 0.051 | 0.051 | 0.051 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | MS  | 4   | 0.039 | 0.042 | 0.040 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MOB | 1   | 0.064 | 0.064 | 0.064 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 418 | 0.012 | 0.251 | 0.117 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 29  | 0.066 | 0.128 | 0.108 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 10  | 0.101 | 0.185 | 0.135 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 1   | 0.117 | 0.117 | 0.117 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 3   | 0.090 | 0.128 | 0.113 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 30  | 0.037 | 0.137 | 0.105 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 4   | 0.093 | 0.106 | 0.102 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 16  | 0.020 | 0.156 | 0.085 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 6   | 0.090 | 0.117 | 0.103 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MFP | 1   | 0.112 | 0.112 | 0.112 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 17  | 0.086 | 0.122 | 0.110 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | FP  | 3   | 0.096 | 0.107 | 0.102 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 22  | 0.027 | 0.178 | 0.105 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 4   | 0.083 | 0.123 | 0.106 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MFP | 3   | 0.028 | 0.186 | 0.100 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 1   | 0.107 | 0.107 | 0.107 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | NE  | 3   | 0.042 | 0.049 | 0.046 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | MS  | 5   | 0.027 | 0.049 | 0.036 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | MOB | 1   | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 2   | 0.025 | 0.040 | 0.033 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 2   | 0.047 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | NE  | 1   | 0.048 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MFP | 4   | 0.063 | 0.182 | 0.110 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MFP | 1   | 0.071 | 0.071 | 0.071 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 2   | 0.069 | 0.120 | 0.094 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 3   | 0.018 | 0.048 | 0.036 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 13  | 0.018 | 0.049 | 0.036 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 5   | 0.018 | 0.044 | 0.035 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MFP | 2   | 0.025 | 0.049 | 0.037 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | KK  | 1   | 0.046 | 0.046 | 0.046 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MFP | 1   | 0.012 | 0.012 | 0.012 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 3   | 0.036 | 0.060 | 0.052 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | FP  | 1   | 0.084 | 0.084 | 0.084 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 2   | 0.031 | 0.048 | 0.040 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 2   | 0.021 | 0.071 | 0.046 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 2   | 0.022 | 0.058 | 0.040 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB | 1   | 0.046 | 0.046 | 0.046 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MOB | 2   | 0.082 | 0.087 | 0.085 |

### **Fox 3-2 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min<br>Range | Max<br>Range | Avg<br>Range |
|------|--------------|--------------|--------------|--------|-------|--------------|--------------|--------------|
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 189   | 0.079        | 0.191        | 0.132        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 389   | 0.078        | 0.190        | 0.128        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2071  | 0.075        | 0.192        | 0.136        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 388   | 0.072        | 0.188        | 0.131        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1336  | 0.070        | 0.191        | 0.140        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 328   | 0.074        | 0.186        | 0.132        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 83    | 0.090        | 0.185        | 0.132        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 31    | 0.076        | 0.181        | 0.120        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 19    | 0.071        | 0.170        | 0.112        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 23    | 0.085        | 0.179        | 0.134        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 75    | 0.080        | 0.181        | 0.131        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 7     | 0.101        | 0.165        | 0.132        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 42    | 0.078        | 0.184        | 0.150        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 5     | 0.084        | 0.155        | 0.101        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 38    | 0.076        | 0.178        | 0.125        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 3     | 0.092        | 0.148        | 0.125        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 45    | 0.086        | 0.178        | 0.129        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 5     | 0.105        | 0.181        | 0.147        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 19    | 0.064        | 0.182        | 0.123        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MOB    | 6     | 0.098        | 0.172        | 0.138        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 5357  | 0.004        | 0.050        | 0.039        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 206   | 0.004        | 0.050        | 0.036        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 49    | 0.007        | 0.050        | 0.032        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 61    | 0.013        | 0.050        | 0.038        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 62    | 0.007        | 0.048        | 0.029        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 11    | 0.081        | 0.172        | 0.115        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 10    | 0.108        | 0.179        | 0.145        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 16    | 0.081        | 0.167        | 0.117        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 15    | 0.081        | 0.178        | 0.131        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 12    | 0.078        | 0.174        | 0.136        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 8     | 0.082        | 0.176        | 0.130        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 7     | 0.065        | 0.142        | 0.097        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | FP     | 2     | 0.097        | 0.140        | 0.119        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MOB    | 2     | 0.119        | 0.149        | 0.134        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MFP    | 9     | 0.086        | 0.162        | 0.119        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 6     | 0.080        | 0.171        | 0.130        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MFP    | 7     | 0.079        | 0.173        | 0.134        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 11    | 0.096        | 0.170        | 0.136        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 15    | 0.114        | 0.178        | 0.150        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MOB    | 1     | 0.079        | 0.079        | 0.079        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 17    | 0.091        | 0.180        | 0.144        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MOB    | 1     | 0.074        | 0.074        | 0.074        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 4     | 0.092        | 0.157        | 0.132        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 14    | 0.082        | 0.163        | 0.120        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MOB    | 3     | 0.093        | 0.136        | 0.108        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 4     | 0.093        | 0.139        | 0.119        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MFP    | 3     | 0.080        | 0.144        | 0.103        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | FP     | 2     | 0.120        | 0.173        | 0.146        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | FP     | 1     | 0.162        | 0.162        | 0.162        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 6     | 0.081        | 0.184        | 0.151        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MFP    | 5     | 0.090        | 0.170        | 0.135        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 7     | 0.085        | 0.183        | 0.138        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 2     | 0.025        | 0.033        | 0.029        |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 37    | 0.012        | 0.274        | 0.105        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | SUS    | 10    | 0.018        | 0.188        | 0.075        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 101   | 0.020        | 0.215        | 0.109        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 66    | 0.022        | 0.276        | 0.104        |
| 2    | Cav w/Spring | Indian w/Win | Colt 1873    | MS     | 19    | 0.015        | 0.048        | 0.035        |
| 2    | Cav w/Spring | Indian w/Win | Colt 1873    | KK     | 3     | 0.038        | 0.048        | 0.043        |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 35    | 0.046        | 0.160        | 0.102        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 4     | 0.046        | 0.279        | 0.107        |
| 2    | Cav w/Spring | Indian w/Smo | Colt 1873    | MS     | 12    | 0.013        | 0.041        | 0.023        |
| 2    | Cav w/Spring | Indian w/Hen | Colt 1873    | NE     | 3     | 0.030        | 0.043        | 0.035        |
| 2    | Cav w/Spring | Indian w/Hen | Colt 1873    | MS     | 2     | 0.033        | 0.043        | 0.038        |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MS     | 15    | 0.020        | 0.049        | 0.041        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 511   | 0.004        | 0.281        | 0.115        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MFP    | 18    | 0.004        | 0.191        | 0.068        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 33    | 0.012        | 0.272        | 0.077        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 15    | 0.008        | 0.118        | 0.067        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 70    | 0.023        | 0.278        | 0.106        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 12    | 0.021        | 0.254        | 0.110        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 12    | 0.022        | 0.279        | 0.108        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MOB    | 2     | 0.005        | 0.116        | 0.060        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 6     | 0.041        | 0.119        | 0.096        |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 6  | 0.024 | 0.133 | 0.067 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 5  | 0.059 | 0.119 | 0.087 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | FP  | 3  | 0.080 | 0.159 | 0.115 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MFP | 7  | 0.028 | 0.154 | 0.060 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | SUS | 50 | 0.011 | 0.265 | 0.080 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | FP  | 6  | 0.005 | 0.121 | 0.060 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 13 | 0.025 | 0.128 | 0.061 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 14 | 0.054 | 0.216 | 0.112 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 6  | 0.006 | 0.094 | 0.055 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MOB | 7  | 0.032 | 0.094 | 0.072 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 7  | 0.056 | 0.218 | 0.116 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | NE  | 7  | 0.007 | 0.047 | 0.021 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | NE  | 7  | 0.002 | 0.040 | 0.022 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 9  | 0.020 | 0.048 | 0.032 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | KK  | 4  | 0.011 | 0.033 | 0.023 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | KK  | 6  | 0.027 | 0.176 | 0.065 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MFP | 4  | 0.027 | 0.062 | 0.044 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MFP | 5  | 0.018 | 0.113 | 0.064 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | FP  | 2  | 0.024 | 0.045 | 0.035 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 6  | 0.004 | 0.049 | 0.032 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | MFP | 1  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MFP | 3  | 0.007 | 0.020 | 0.015 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 3  | 0.010 | 0.077 | 0.043 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | NE  | 2  | 0.011 | 0.013 | 0.012 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | FP  | 1  | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MFP | 3  | 0.019 | 0.029 | 0.024 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 2  | 0.014 | 0.025 | 0.020 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 2  | 0.010 | 0.032 | 0.021 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 7  | 0.025 | 0.180 | 0.092 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MOB | 1  | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1  | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | FP  | 2  | 0.064 | 0.100 | 0.082 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 8  | 0.012 | 0.029 | 0.022 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MFP | 1  | 0.048 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 1  | 0.055 | 0.055 | 0.055 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | NE  | 2  | 0.032 | 0.038 | 0.035 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | MS  | 3  | 0.009 | 0.039 | 0.029 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MOB | 1  | 0.006 | 0.006 | 0.006 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 1  | 0.084 | 0.084 | 0.084 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MOB | 1  | 0.015 | 0.015 | 0.015 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | KK  | 1  | 0.009 | 0.009 | 0.009 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | NE  | 2  | 0.012 | 0.016 | 0.014 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MOB | 1  | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MOB | 1  | 0.034 | 0.034 | 0.034 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 2  | 0.074 | 0.128 | 0.101 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | FP  | 1  | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 2  | 0.046 | 0.053 | 0.049 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MFP | 1  | 0.030 | 0.030 | 0.030 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | FP  | 1  | 0.079 | 0.079 | 0.079 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MFP | 1  | 0.164 | 0.164 | 0.164 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MOB | 1  | 0.196 | 0.196 | 0.196 |

### Fox 3-3 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2562  | 0.077     | 0.185     | 0.135     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 222   | 0.071     | 0.196     | 0.136     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 383   | 0.065     | 0.193     | 0.136     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 435   | 0.058     | 0.185     | 0.136     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1698  | 0.060     | 0.199     | 0.140     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 11    | 0.065     | 0.180     | 0.132     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 18    | 0.102     | 0.178     | 0.139     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 10    | 0.095     | 0.170     | 0.128     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 49    | 0.081     | 0.184     | 0.140     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 80    | 0.084     | 0.184     | 0.132     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 41    | 0.077     | 0.161     | 0.123     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 31    | 0.082     | 0.179     | 0.134     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 464   | 0.060     | 0.185     | 0.129     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 37    | 0.072     | 0.171     | 0.129     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 21    | 0.075     | 0.172     | 0.127     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 32    | 0.079     | 0.196     | 0.120     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 15    | 0.105     | 0.183     | 0.153     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 17    | 0.100     | 0.168     | 0.145     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 3     | 0.092     | 0.152     | 0.123     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | FP     | 3     | 0.139     | 0.161     | 0.150     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 75    | 0.077     | 0.179     | 0.127     |



|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 14   | 0.084 | 0.184 | 0.132 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 11   | 0.081 | 0.183 | 0.127 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 13   | 0.066 | 0.185 | 0.118 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 5    | 0.102 | 0.176 | 0.138 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MFP | 9    | 0.077 | 0.180 | 0.135 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 5114 | 0.004 | 0.051 | 0.038 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 208  | 0.004 | 0.050 | 0.034 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 36   | 0.009 | 0.044 | 0.027 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 86   | 0.008 | 0.049 | 0.029 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 70   | 0.013 | 0.049 | 0.038 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 8    | 0.065 | 0.160 | 0.113 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 22   | 0.064 | 0.151 | 0.102 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 7    | 0.074 | 0.162 | 0.103 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 17   | 0.072 | 0.178 | 0.134 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 13   | 0.094 | 0.175 | 0.125 |
| 1 | Indian w/Win | Cav w/Spring | Winchester   | MOB | 7    | 0.083 | 0.174 | 0.140 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 8    | 0.074 | 0.179 | 0.139 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 6    | 0.086 | 0.153 | 0.125 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | FP  | 3    | 0.114 | 0.140 | 0.129 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | FP  | 2    | 0.071 | 0.078 | 0.075 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 4    | 0.119 | 0.163 | 0.133 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 4    | 0.111 | 0.181 | 0.136 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MFP | 3    | 0.061 | 0.094 | 0.078 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MOB | 1    | 0.080 | 0.080 | 0.080 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 4    | 0.028 | 0.043 | 0.034 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MFP | 6    | 0.083 | 0.175 | 0.118 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MOB | 3    | 0.079 | 0.168 | 0.133 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 3    | 0.121 | 0.148 | 0.138 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MFP | 4    | 0.099 | 0.158 | 0.135 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MOB | 2    | 0.112 | 0.142 | 0.127 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 1    | 0.102 | 0.102 | 0.102 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 88   | 0.034 | 0.138 | 0.107 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 329  | 0.032 | 0.197 | 0.115 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 46   | 0.083 | 0.163 | 0.111 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 2    | 0.110 | 0.124 | 0.117 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 26   | 0.089 | 0.130 | 0.110 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 1    | 0.109 | 0.109 | 0.109 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MOB | 1    | 0.100 | 0.100 | 0.100 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 29   | 0.031 | 0.149 | 0.107 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 5    | 0.099 | 0.126 | 0.109 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 9    | 0.040 | 0.171 | 0.115 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | FP  | 1    | 0.107 | 0.107 | 0.107 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 4    | 0.024 | 0.113 | 0.069 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 18   | 0.009 | 0.172 | 0.090 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 7    | 0.080 | 0.135 | 0.105 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 3    | 0.108 | 0.141 | 0.122 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 16   | 0.020 | 0.219 | 0.105 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MFP | 1    | 0.096 | 0.096 | 0.096 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MFP | 1    | 0.097 | 0.097 | 0.097 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 2    | 0.118 | 0.119 | 0.118 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | FP  | 1    | 0.078 | 0.078 | 0.078 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 1    | 0.086 | 0.086 | 0.086 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 1    | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MFP | 6    | 0.025 | 0.116 | 0.072 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 4    | 0.026 | 0.041 | 0.035 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MS  | 7    | 0.026 | 0.042 | 0.037 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MFP | 2    | 0.016 | 0.042 | 0.029 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | MS  | 3    | 0.047 | 0.050 | 0.049 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 2    | 0.020 | 0.053 | 0.036 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | MFP | 1    | 0.050 | 0.050 | 0.050 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 2    | 0.038 | 0.172 | 0.105 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 7    | 0.041 | 0.106 | 0.082 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 2    | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 2    | 0.039 | 0.039 | 0.039 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | KK  | 1    | 0.002 | 0.002 | 0.002 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MFP | 2    | 0.027 | 0.049 | 0.038 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MOB | 2    | 0.056 | 0.175 | 0.115 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB | 1    | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 1    | 0.037 | 0.037 | 0.037 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 1    | 0.022 | 0.022 | 0.022 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 1    | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 3    | 0.059 | 0.198 | 0.144 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MOB | 1    | 0.183 | 0.183 | 0.183 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MFP | 1    | 0.200 | 0.200 | 0.200 |

### **Fox 3-4 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min<br>Range | Max<br>Range | Avg<br>Range |
|------|--------------|--------------|--------------|--------|-------|--------------|--------------|--------------|
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1575  | 0.059        | 0.200        | 0.146        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 353   | 0.044        | 0.199        | 0.137        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 23    | 0.074        | 0.186        | 0.129        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2221  | 0.060        | 0.190        | 0.140        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 70    | 0.086        | 0.187        | 0.139        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 56    | 0.081        | 0.186        | 0.142        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 49    | 0.085        | 0.174        | 0.127        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 6     | 0.066        | 0.169        | 0.134        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 432   | 0.032        | 0.196        | 0.134        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | FP     | 4     | 0.093        | 0.132        | 0.113        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 193   | 0.064        | 0.197        | 0.138        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 34    | 0.077        | 0.182        | 0.129        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 21    | 0.100        | 0.179        | 0.134        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 7     | 0.067        | 0.191        | 0.120        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 25    | 0.075        | 0.180        | 0.139        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 360   | 0.060        | 0.191        | 0.134        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 13    | 0.065        | 0.179        | 0.125        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 63    | 0.085        | 0.178        | 0.139        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 8     | 0.069        | 0.174        | 0.128        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 35    | 0.073        | 0.175        | 0.122        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 15    | 0.074        | 0.183        | 0.130        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 21    | 0.058        | 0.159        | 0.107        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 16    | 0.100        | 0.182        | 0.151        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 23    | 0.065        | 0.199        | 0.119        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 5474  | 0.001        | 0.051        | 0.038        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 251   | 0.001        | 0.050        | 0.034        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 60    | 0.008        | 0.048        | 0.029        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 52    | 0.011        | 0.049        | 0.032        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 12    | 0.065        | 0.189        | 0.113        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 4     | 0.085        | 0.177        | 0.120        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 15    | 0.067        | 0.174        | 0.122        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 7     | 0.039        | 0.171        | 0.104        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 6     | 0.037        | 0.180        | 0.114        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MOB    | 2     | 0.091        | 0.127        | 0.109        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 4     | 0.069        | 0.131        | 0.089        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 7     | 0.057        | 0.162        | 0.123        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 8     | 0.079        | 0.190        | 0.135        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MOB    | 2     | 0.083        | 0.127        | 0.105        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 8     | 0.077        | 0.146        | 0.107        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 17    | 0.069        | 0.178        | 0.122        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 5     | 0.081        | 0.163        | 0.132        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 39    | 0.014        | 0.050        | 0.037        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MFP    | 6     | 0.062        | 0.140        | 0.108        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MFP    | 7     | 0.076        | 0.174        | 0.127        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MFP    | 6     | 0.071        | 0.161        | 0.116        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 6     | 0.068        | 0.181        | 0.118        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MOB    | 1     | 0.083        | 0.083        | 0.083        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | FP     | 4     | 0.064        | 0.186        | 0.114        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MOB    | 3     | 0.094        | 0.168        | 0.122        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | FP     | 3     | 0.139        | 0.159        | 0.151        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MOB    | 2     | 0.122        | 0.136        | 0.129        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | FP     | 1     | 0.097        | 0.097        | 0.097        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MFP    | 5     | 0.070        | 0.181        | 0.130        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 402   | 0.005        | 0.285        | 0.118        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 95    | 0.009        | 0.283        | 0.114        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 62    | 0.030        | 0.274        | 0.114        |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 26    | 0.039        | 0.278        | 0.116        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 4     | 0.023        | 0.210        | 0.100        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 20    | 0.021        | 0.209        | 0.109        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MFP    | 7     | 0.014        | 0.284        | 0.136        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 47    | 0.029        | 0.269        | 0.107        |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | KK     | 3     | 0.077        | 0.116        | 0.099        |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 34    | 0.027        | 0.269        | 0.116        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 8     | 0.008        | 0.282        | 0.082        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 17    | 0.009        | 0.273        | 0.097        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | DUD    | 2     | 0.039        | 0.096        | 0.067        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | DUD    | 1     | 0.105        | 0.105        | 0.105        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | FP     | 3     | 0.038        | 0.280        | 0.139        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MFP    | 36    | 0.017        | 0.279        | 0.142        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 2     | 0.006        | 0.112        | 0.059        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 42    | 0.012        | 0.275        | 0.118        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 19    | 0.069        | 0.269        | 0.135        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 5     | 0.055        | 0.270        | 0.128        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MOB    | 1     | 0.057        | 0.057        | 0.057        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 56    | 0.012        | 0.277        | 0.129        |
| 2    | Cav w/Spring | Indian w/Win | Colt 1873    | NE     | 6     | 0.021        | 0.047        | 0.033        |
| 2    | Cav w/Spring | Indian w/Win | Colt 1873    | MOB    | 3     | 0.035        | 0.048        | 0.040        |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | MS  | 2  | 0.022 | 0.026 | 0.024 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | KK  | 2  | 0.026 | 0.032 | 0.029 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 14 | 0.019 | 0.272 | 0.105 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 9  | 0.019 | 0.265 | 0.096 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | NE  | 5  | 0.026 | 0.039 | 0.036 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MFP | 1  | 0.026 | 0.026 | 0.026 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | NE  | 1  | 0.027 | 0.027 | 0.027 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | NE  | 3  | 0.033 | 0.040 | 0.036 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MS  | 1  | 0.027 | 0.027 | 0.027 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MFP | 1  | 0.020 | 0.020 | 0.020 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | MS  | 3  | 0.026 | 0.026 | 0.026 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | NE  | 10 | 0.019 | 0.039 | 0.027 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 3  | 0.021 | 0.038 | 0.027 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 19 | 0.010 | 0.047 | 0.036 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 4  | 0.031 | 0.047 | 0.039 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MS  | 29 | 0.020 | 0.051 | 0.037 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1  | 0.017 | 0.017 | 0.017 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | NE  | 2  | 0.042 | 0.045 | 0.044 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 3  | 0.038 | 0.045 | 0.042 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | FP  | 1  | 0.045 | 0.045 | 0.045 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | FP  | 9  | 0.043 | 0.270 | 0.116 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MS  | 2  | 0.024 | 0.040 | 0.032 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MOB | 4  | 0.021 | 0.262 | 0.105 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | FP  | 4  | 0.014 | 0.043 | 0.029 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 1  | 0.062 | 0.062 | 0.062 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 2  | 0.006 | 0.027 | 0.017 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MFP | 1  | 0.018 | 0.018 | 0.018 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MOB | 1  | 0.017 | 0.017 | 0.017 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | FP  | 1  | 0.021 | 0.021 | 0.021 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 6  | 0.043 | 0.092 | 0.062 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 4  | 0.014 | 0.187 | 0.088 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MOB | 1  | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MFP | 3  | 0.050 | 0.110 | 0.072 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MOB | 3  | 0.033 | 0.282 | 0.118 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 5  | 0.051 | 0.277 | 0.109 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | FP  | 1  | 0.067 | 0.067 | 0.067 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 2  | 0.057 | 0.199 | 0.128 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MFP | 1  | 0.134 | 0.134 | 0.134 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MFP | 1  | 0.013 | 0.013 | 0.013 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MOB | 2  | 0.034 | 0.041 | 0.038 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MFP | 3  | 0.029 | 0.262 | 0.146 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | KK  | 1  | 0.024 | 0.024 | 0.024 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | MFP | 1  | 0.024 | 0.024 | 0.024 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 4  | 0.022 | 0.262 | 0.148 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 2  | 0.084 | 0.112 | 0.098 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MOB | 1  | 0.021 | 0.021 | 0.021 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | FP  | 2  | 0.269 | 0.274 | 0.271 |

### **Fox 3-5 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2495  | 0.070     | 0.185     | 0.138     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 195   | 0.054     | 0.185     | 0.135     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1507  | 0.066     | 0.191     | 0.145     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 421   | 0.060     | 0.186     | 0.137     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 412   | 0.057     | 0.185     | 0.131     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 344   | 0.061     | 0.185     | 0.140     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 16    | 0.092     | 0.173     | 0.145     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 72    | 0.088     | 0.179     | 0.137     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 17    | 0.073     | 0.168     | 0.128     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 26    | 0.068     | 0.189     | 0.117     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 11    | 0.089     | 0.183     | 0.157     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 91    | 0.091     | 0.185     | 0.137     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 14    | 0.088     | 0.166     | 0.117     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 47    | 0.087     | 0.174     | 0.133     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 17    | 0.077     | 0.174     | 0.130     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 56    | 0.077     | 0.184     | 0.141     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 10    | 0.100     | 0.166     | 0.128     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 17    | 0.091     | 0.185     | 0.143     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 6     | 0.080     | 0.139     | 0.104     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MOB    | 2     | 0.105     | 0.127     | 0.116     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 54    | 0.074     | 0.180     | 0.132     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 29    | 0.071     | 0.176     | 0.122     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MFP    | 12    | 0.071     | 0.174     | 0.127     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 9     | 0.104     | 0.184     | 0.149     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | FP     | 3     | 0.121     | 0.166     | 0.138     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 25   | 0.062 | 0.170 | 0.120 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 19   | 0.059 | 0.163 | 0.114 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 19   | 0.081 | 0.185 | 0.147 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 10   | 0.083 | 0.177 | 0.136 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 5273 | 0.004 | 0.051 | 0.039 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 64   | 0.008 | 0.047 | 0.030 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 215  | 0.008 | 0.050 | 0.035 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 54   | 0.011 | 0.049 | 0.030 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 46   | 0.012 | 0.050 | 0.037 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 13   | 0.089 | 0.168 | 0.132 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 16   | 0.111 | 0.185 | 0.148 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MOB | 4    | 0.106 | 0.160 | 0.128 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 5    | 0.085 | 0.149 | 0.120 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 12   | 0.063 | 0.163 | 0.121 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 10   | 0.068 | 0.145 | 0.110 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MFP | 8    | 0.066 | 0.150 | 0.100 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 5    | 0.099 | 0.178 | 0.156 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 8    | 0.081 | 0.172 | 0.120 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 3    | 0.101 | 0.184 | 0.153 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | FP  | 2    | 0.084 | 0.085 | 0.084 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MFP | 3    | 0.081 | 0.171 | 0.117 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MOB | 3    | 0.138 | 0.165 | 0.147 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 6    | 0.135 | 0.169 | 0.148 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MFP | 4    | 0.099 | 0.150 | 0.126 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | FP  | 1    | 0.096 | 0.096 | 0.096 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 40   | 0.082 | 0.195 | 0.121 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 3    | 0.082 | 0.146 | 0.117 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 19   | 0.035 | 0.210 | 0.116 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 25   | 0.019 | 0.199 | 0.124 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 76   | 0.009 | 0.206 | 0.112 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MS  | 7    | 0.031 | 0.049 | 0.042 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | KK  | 2    | 0.036 | 0.045 | 0.041 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 5    | 0.031 | 0.045 | 0.039 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 305  | 0.033 | 0.183 | 0.114 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 11   | 0.094 | 0.152 | 0.119 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 2    | 0.107 | 0.114 | 0.110 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 3    | 0.103 | 0.131 | 0.115 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 2    | 0.110 | 0.115 | 0.113 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 2    | 0.040 | 0.090 | 0.065 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 2    | 0.117 | 0.120 | 0.119 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 2    | 0.104 | 0.140 | 0.122 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 69   | 0.035 | 0.186 | 0.112 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 16   | 0.010 | 0.160 | 0.113 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 1    | 0.108 | 0.108 | 0.108 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 3    | 0.016 | 0.141 | 0.090 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 37   | 0.037 | 0.220 | 0.113 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 2    | 0.137 | 0.198 | 0.167 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 2    | 0.047 | 0.105 | 0.076 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | FP  | 5    | 0.057 | 0.137 | 0.105 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB | 1    | 0.033 | 0.033 | 0.033 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MFP | 1    | 0.091 | 0.091 | 0.091 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 8    | 0.022 | 0.050 | 0.042 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 1    | 0.022 | 0.022 | 0.022 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MFP | 21   | 0.024 | 0.138 | 0.111 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MFP | 1    | 0.052 | 0.052 | 0.052 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 2    | 0.040 | 0.046 | 0.043 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 1    | 0.182 | 0.182 | 0.182 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MOB | 1    | 0.203 | 0.203 | 0.203 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 4    | 0.123 | 0.130 | 0.128 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MOB | 10   | 0.112 | 0.136 | 0.124 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | FP  | 1    | 0.134 | 0.134 | 0.134 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MFP | 2    | 0.136 | 0.137 | 0.137 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MOB | 1    | 0.130 | 0.130 | 0.130 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 2    | 0.138 | 0.139 | 0.138 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MFP | 1    | 0.144 | 0.144 | 0.144 |

### **Fox 3-6 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 450   | 0.044     | 0.276     | 0.139     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1551  | 0.066     | 0.198     | 0.144     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 351   | 0.055     | 0.286     | 0.140     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 17    | 0.075     | 0.166     | 0.105     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 200   | 0.056     | 0.185     | 0.136     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 438   | 0.047     | 0.281     | 0.138     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 91    | 0.081     | 0.180     | 0.134     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MS  | 2780 | 0.061 | 0.185 | 0.142 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 99   | 0.085 | 0.185 | 0.140 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 32   | 0.067 | 0.182 | 0.119 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 15   | 0.104 | 0.177 | 0.145 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MFP | 30   | 0.094 | 0.174 | 0.136 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 18   | 0.089 | 0.185 | 0.139 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | FP  | 14   | 0.086 | 0.176 | 0.127 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 21   | 0.057 | 0.175 | 0.120 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 50   | 0.077 | 0.179 | 0.118 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 50   | 0.080 | 0.183 | 0.147 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | KK  | 49   | 0.086 | 0.182 | 0.130 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 19   | 0.100 | 0.184 | 0.147 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 6    | 0.076 | 0.138 | 0.114 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MFP | 5    | 0.095 | 0.149 | 0.125 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP | 16   | 0.075 | 0.173 | 0.128 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 5    | 0.087 | 0.167 | 0.126 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 14   | 0.051 | 0.169 | 0.104 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 12   | 0.070 | 0.179 | 0.125 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 5    | 0.071 | 0.132 | 0.104 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 18   | 0.100 | 0.183 | 0.134 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 6    | 0.062 | 0.142 | 0.104 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 7    | 0.058 | 0.167 | 0.115 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 6498 | 0.005 | 0.051 | 0.040 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 268  | 0.007 | 0.051 | 0.037 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 81   | 0.006 | 0.051 | 0.034 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 68   | 0.008 | 0.050 | 0.032 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 51   | 0.023 | 0.050 | 0.040 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MOB | 10   | 0.112 | 0.176 | 0.145 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MFP | 2    | 0.110 | 0.118 | 0.114 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 3    | 0.108 | 0.183 | 0.137 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 7    | 0.083 | 0.134 | 0.107 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MOB | 2    | 0.102 | 0.147 | 0.124 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 2    | 0.092 | 0.140 | 0.116 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MOB | 2    | 0.083 | 0.175 | 0.129 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 14   | 0.075 | 0.175 | 0.134 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 6    | 0.086 | 0.150 | 0.120 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MFP | 7    | 0.075 | 0.155 | 0.115 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | FP  | 2    | 0.061 | 0.106 | 0.084 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 9    | 0.075 | 0.183 | 0.129 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 12   | 0.078 | 0.163 | 0.114 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 5    | 0.011 | 0.042 | 0.027 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | FP  | 1    | 0.072 | 0.072 | 0.072 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MFP | 5    | 0.052 | 0.168 | 0.124 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MOB | 1    | 0.149 | 0.149 | 0.149 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | FP  | 1    | 0.119 | 0.119 | 0.119 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | FP  | 1    | 0.119 | 0.119 | 0.119 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 24   | 0.056 | 0.212 | 0.125 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 1    | 0.083 | 0.083 | 0.083 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | KK  | 1    | 0.048 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 3    | 0.052 | 0.183 | 0.114 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 7    | 0.032 | 0.049 | 0.042 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MFP | 2    | 0.038 | 0.041 | 0.039 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 1    | 0.026 | 0.026 | 0.026 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 175  | 0.014 | 0.215 | 0.108 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 71   | 0.087 | 0.179 | 0.111 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 19   | 0.076 | 0.208 | 0.117 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 37   | 0.048 | 0.187 | 0.111 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 8    | 0.063 | 0.115 | 0.103 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 2    | 0.099 | 0.101 | 0.100 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 27   | 0.057 | 0.194 | 0.115 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | DUD | 1    | 0.113 | 0.113 | 0.113 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 6    | 0.075 | 0.124 | 0.095 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 1    | 0.117 | 0.117 | 0.117 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 8    | 0.038 | 0.121 | 0.082 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MOB | 2    | 0.080 | 0.092 | 0.086 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MFP | 2    | 0.082 | 0.087 | 0.085 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 6    | 0.086 | 0.110 | 0.103 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MOB | 1    | 0.108 | 0.108 | 0.108 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 1    | 0.127 | 0.127 | 0.127 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 3    | 0.093 | 0.106 | 0.101 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 2    | 0.102 | 0.147 | 0.124 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 4    | 0.065 | 0.195 | 0.106 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MFP | 1    | 0.168 | 0.168 | 0.168 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MFP | 3    | 0.028 | 0.171 | 0.080 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 1    | 0.076 | 0.076 | 0.076 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | NE  | 2    | 0.034 | 0.047 | 0.041 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873    | MS  | 5    | 0.016 | 0.047 | 0.037 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | KK  | 1    | 0.040 | 0.040 | 0.040 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | NE  | 4    | 0.026 | 0.047 | 0.033 |

|   |              |              |             |     |   |       |       |       |
|---|--------------|--------------|-------------|-----|---|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 1 | 0.080 | 0.080 | 0.080 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 2 | 0.040 | 0.047 | 0.044 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 1 | 0.031 | 0.031 | 0.031 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 5 | 0.031 | 0.046 | 0.037 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 1 | 0.147 | 0.147 | 0.147 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | FP  | 1 | 0.122 | 0.122 | 0.122 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | KK  | 2 | 0.026 | 0.041 | 0.034 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MOB | 1 | 0.147 | 0.147 | 0.147 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | FP  | 1 | 0.074 | 0.074 | 0.074 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | FP  | 1 | 0.062 | 0.062 | 0.062 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 1 | 0.085 | 0.085 | 0.085 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 4 | 0.040 | 0.050 | 0.044 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | NE  | 1 | 0.045 | 0.045 | 0.045 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MFP | 1 | 0.033 | 0.033 | 0.033 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 1 | 0.040 | 0.040 | 0.040 |

### **Fox 3-7 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MFP    | 6     | 0.091     | 0.128     | 0.105     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1600  | 0.055     | 0.215     | 0.144     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2717  | 0.080     | 0.189     | 0.137     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 11    | 0.069     | 0.182     | 0.121     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 211   | 0.066     | 0.205     | 0.135     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 351   | 0.072     | 0.198     | 0.137     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 26    | 0.091     | 0.175     | 0.126     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 15    | 0.079     | 0.190     | 0.146     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 445   | 0.066     | 0.197     | 0.134     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 11    | 0.058     | 0.169     | 0.112     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 62    | 0.069     | 0.185     | 0.143     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MOB    | 13    | 0.101     | 0.172     | 0.136     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 54    | 0.081     | 0.179     | 0.134     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 448   | 0.060     | 0.185     | 0.129     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 16    | 0.072     | 0.179     | 0.122     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 14    | 0.072     | 0.174     | 0.123     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 3     | 0.145     | 0.154     | 0.150     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 33    | 0.086     | 0.184     | 0.132     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 40    | 0.081     | 0.178     | 0.134     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 104   | 0.085     | 0.184     | 0.137     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 9     | 0.097     | 0.165     | 0.125     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | FP     | 5     | 0.068     | 0.177     | 0.110     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 23    | 0.066     | 0.189     | 0.127     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 10    | 0.089     | 0.195     | 0.143     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 10    | 0.100     | 0.183     | 0.135     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 5535  | 0.001     | 0.051     | 0.038     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 245   | 0.001     | 0.050     | 0.032     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 72    | 0.005     | 0.049     | 0.029     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 54    | 0.011     | 0.049     | 0.036     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 55    | 0.010     | 0.049     | 0.032     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 24    | 0.064     | 0.184     | 0.124     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MFP    | 12    | 0.074     | 0.184     | 0.111     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 4     | 0.089     | 0.164     | 0.132     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MFP    | 9     | 0.090     | 0.193     | 0.136     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MFP    | 4     | 0.095     | 0.150     | 0.110     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MOB    | 4     | 0.083     | 0.189     | 0.127     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 44    | 0.055     | 0.188     | 0.132     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | FP     | 1     | 0.092     | 0.092     | 0.092     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 3     | 0.077     | 0.082     | 0.081     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 8     | 0.076     | 0.209     | 0.129     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 13    | 0.076     | 0.189     | 0.110     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 15    | 0.081     | 0.192     | 0.131     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 5     | 0.123     | 0.172     | 0.155     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 10    | 0.057     | 0.203     | 0.140     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MOB    | 3     | 0.094     | 0.186     | 0.140     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 4     | 0.075     | 0.111     | 0.091     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 2     | 0.081     | 0.110     | 0.095     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 6     | 0.074     | 0.206     | 0.153     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | FP     | 1     | 0.167     | 0.167     | 0.167     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 2     | 0.155     | 0.161     | 0.158     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MOB    | 2     | 0.139     | 0.146     | 0.143     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | FP     | 1     | 0.049     | 0.049     | 0.049     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 5     | 0.019     | 0.046     | 0.033     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 2     | 0.070     | 0.153     | 0.112     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 69    | 0.063     | 0.167     | 0.111     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MFP    | 2     | 0.039     | 0.081     | 0.060     |
| 2    | Cav w/Spring | Indian w/Win | Colt 1873    | MS     | 12    | 0.030     | 0.050     | 0.041     |

|   |              |              |             |     |     |       |       |       |
|---|--------------|--------------|-------------|-----|-----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 3   | 0.023 | 0.044 | 0.034 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 1   | 0.045 | 0.045 | 0.045 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 1   | 0.045 | 0.045 | 0.045 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MS  | 26  | 0.043 | 0.168 | 0.113 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | KK  | 11  | 0.013 | 0.175 | 0.084 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MS  | 268 | 0.021 | 0.274 | 0.117 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MFP | 1   | 0.024 | 0.024 | 0.024 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MFP | 3   | 0.045 | 0.112 | 0.069 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MS  | 26  | 0.040 | 0.155 | 0.107 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MS  | 55  | 0.081 | 0.198 | 0.118 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MS  | 20  | 0.036 | 0.189 | 0.099 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MS  | 12  | 0.091 | 0.160 | 0.124 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 3   | 0.115 | 0.121 | 0.118 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 2   | 0.018 | 0.099 | 0.059 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 6   | 0.017 | 0.107 | 0.070 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 2   | 0.099 | 0.121 | 0.110 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 11  | 0.080 | 0.248 | 0.128 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 6   | 0.057 | 0.162 | 0.099 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 1   | 0.098 | 0.098 | 0.098 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | SUS | 20  | 0.005 | 0.174 | 0.099 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MOB | 2   | 0.058 | 0.109 | 0.084 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 2   | 0.081 | 0.091 | 0.086 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 1   | 0.081 | 0.081 | 0.081 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 3   | 0.110 | 0.169 | 0.142 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MFP | 3   | 0.024 | 0.124 | 0.060 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MFP | 1   | 0.191 | 0.191 | 0.191 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MFP | 1   | 0.050 | 0.050 | 0.050 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | MS  | 2   | 0.025 | 0.047 | 0.036 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | KK  | 1   | 0.047 | 0.047 | 0.047 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | FP  | 1   | 0.100 | 0.100 | 0.100 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | FP  | 1   | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | NE  | 2   | 0.010 | 0.011 | 0.011 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1   | 0.010 | 0.010 | 0.010 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | SUS | 1   | 0.025 | 0.025 | 0.025 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MS  | 6   | 0.008 | 0.022 | 0.016 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | NE  | 4   | 0.006 | 0.025 | 0.013 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 2   | 0.006 | 0.025 | 0.015 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | NE  | 3   | 0.030 | 0.037 | 0.035 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 1   | 0.015 | 0.015 | 0.015 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | FP  | 1   | 0.119 | 0.119 | 0.119 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | FP  | 1   | 0.114 | 0.114 | 0.114 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 2   | 0.110 | 0.120 | 0.115 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 1   | 0.109 | 0.109 | 0.109 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MS  | 6   | 0.014 | 0.033 | 0.024 |

### Fox 3-8 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2467  | 0.080     | 0.185     | 0.138     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1646  | 0.069     | 0.203     | 0.144     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 21    | 0.052     | 0.184     | 0.121     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 361   | 0.063     | 0.193     | 0.135     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 87    | 0.085     | 0.184     | 0.141     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 459   | 0.049     | 0.185     | 0.133     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 437   | 0.051     | 0.185     | 0.134     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 79    | 0.080     | 0.181     | 0.128     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 43    | 0.091     | 0.175     | 0.131     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 221   | 0.062     | 0.195     | 0.135     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 57    | 0.071     | 0.184     | 0.127     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 17    | 0.074     | 0.168     | 0.122     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 11    | 0.079     | 0.179     | 0.130     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 20    | 0.108     | 0.178     | 0.150     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 26    | 0.071     | 0.176     | 0.153     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 29    | 0.086     | 0.183     | 0.133     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 3     | 0.086     | 0.154     | 0.132     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 22    | 0.063     | 0.179     | 0.120     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 64    | 0.077     | 0.189     | 0.147     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MOB    | 2     | 0.134     | 0.136     | 0.135     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 3     | 0.110     | 0.131     | 0.122     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 12    | 0.076     | 0.182     | 0.137     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 22    | 0.069     | 0.170     | 0.131     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MOB    | 6     | 0.085     | 0.153     | 0.125     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MOB    | 5     | 0.089     | 0.144     | 0.113     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MFP    | 2     | 0.090     | 0.124     | 0.107     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 12    | 0.068     | 0.175     | 0.117     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 5340  | 0.004     | 0.051     | 0.039     |

|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 235 | 0.003 | 0.050 | 0.034 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 61  | 0.007 | 0.050 | 0.033 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 71  | 0.005 | 0.049 | 0.030 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 62  | 0.013 | 0.050 | 0.039 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 19  | 0.078 | 0.185 | 0.128 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | TL  | 6   | 0.072 | 0.148 | 0.126 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | KK  | 8   | 0.074 | 0.171 | 0.123 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 16  | 0.051 | 0.170 | 0.105 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 11  | 0.077 | 0.181 | 0.116 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | DUD | 12  | 0.079 | 0.162 | 0.113 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | FP  | 7   | 0.067 | 0.177 | 0.124 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MFP | 11  | 0.073 | 0.147 | 0.109 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 5   | 0.067 | 0.158 | 0.104 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 5   | 0.095 | 0.181 | 0.136 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 7   | 0.088 | 0.194 | 0.159 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MFP | 5   | 0.113 | 0.171 | 0.139 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | FP  | 2   | 0.083 | 0.156 | 0.120 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 4   | 0.070 | 0.171 | 0.137 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 4   | 0.082 | 0.148 | 0.109 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | FP  | 2   | 0.103 | 0.142 | 0.123 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | MFP | 5   | 0.058 | 0.147 | 0.103 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 3   | 0.112 | 0.148 | 0.135 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | FP  | 1   | 0.042 | 0.042 | 0.042 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 1   | 0.023 | 0.023 | 0.023 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 9   | 0.011 | 0.187 | 0.096 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 44  | 0.018 | 0.277 | 0.124 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 15  | 0.018 | 0.246 | 0.101 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 6   | 0.037 | 0.200 | 0.104 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 99  | 0.021 | 0.269 | 0.112 |
| 2 | Cav w/Spring | Indian w/Sho | Colt 1873    | MS  | 6   | 0.022 | 0.050 | 0.037 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 12  | 0.012 | 0.215 | 0.076 |
| 2 | Cav w/Spring | Indian w/Sho | Colt 1873    | MFP | 2   | 0.042 | 0.047 | 0.044 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 65  | 0.008 | 0.209 | 0.100 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 6   | 0.031 | 0.202 | 0.082 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 6   | 0.007 | 0.043 | 0.027 |
| 2 | Cav w/Spring | Indian w/Sho | Colt 1873    | NE  | 3   | 0.026 | 0.050 | 0.039 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MS  | 8   | 0.034 | 0.043 | 0.039 |
| 2 | Cav w/Spring | Indian w/Sho | Colt 1873    | MOB | 1   | 0.045 | 0.045 | 0.045 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | KK  | 5   | 0.028 | 0.048 | 0.037 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 13  | 0.014 | 0.111 | 0.046 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MFP | 1   | 0.028 | 0.028 | 0.028 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | SUS | 5   | 0.014 | 0.117 | 0.057 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 42  | 0.020 | 0.205 | 0.077 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | MS  | 4   | 0.023 | 0.043 | 0.035 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 356 | 0.010 | 0.283 | 0.111 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 51  | 0.016 | 0.285 | 0.110 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | FP  | 10  | 0.006 | 0.158 | 0.069 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | KK  | 6   | 0.015 | 0.049 | 0.034 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 18  | 0.007 | 0.048 | 0.028 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 12  | 0.015 | 0.048 | 0.032 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | MS  | 33  | 0.018 | 0.285 | 0.117 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | FP  | 3   | 0.010 | 0.110 | 0.074 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | DUD | 1   | 0.113 | 0.113 | 0.113 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 2   | 0.084 | 0.088 | 0.086 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 6   | 0.054 | 0.138 | 0.080 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 4   | 0.006 | 0.237 | 0.114 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 13  | 0.028 | 0.130 | 0.085 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MFP | 15  | 0.009 | 0.281 | 0.090 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 5   | 0.052 | 0.260 | 0.128 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 11  | 0.020 | 0.279 | 0.086 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | FP  | 1   | 0.115 | 0.115 | 0.115 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 28  | 0.016 | 0.284 | 0.081 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | MS  | 3   | 0.044 | 0.048 | 0.047 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MFP | 8   | 0.016 | 0.202 | 0.087 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | MS  | 5   | 0.041 | 0.051 | 0.045 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | KK  | 1   | 0.018 | 0.018 | 0.018 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MOB | 7   | 0.013 | 0.162 | 0.060 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | MFP | 2   | 0.014 | 0.076 | 0.045 |
| 2 | Cav w/Spring | Indian w/Sho | Colt 1873    | KK  | 1   | 0.026 | 0.026 | 0.026 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | NE  | 3   | 0.044 | 0.051 | 0.047 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | KK  | 1   | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | NE  | 2   | 0.022 | 0.022 | 0.022 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 5   | 0.044 | 0.229 | 0.095 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MFP | 4   | 0.039 | 0.275 | 0.121 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MOB | 3   | 0.048 | 0.283 | 0.130 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 1   | 0.006 | 0.006 | 0.006 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MOB | 2   | 0.013 | 0.040 | 0.027 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | KK  | 1   | 0.006 | 0.006 | 0.006 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | NE  | 8   | 0.014 | 0.045 | 0.037 |



|   |              |              |             |     |   |       |       |       |
|---|--------------|--------------|-------------|-----|---|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 4 | 0.013 | 0.090 | 0.042 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | MFP | 2 | 0.006 | 0.037 | 0.021 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | FP  | 1 | 0.029 | 0.029 | 0.029 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MFP | 1 | 0.137 | 0.137 | 0.137 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | FP  | 1 | 0.018 | 0.018 | 0.018 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MOB | 3 | 0.006 | 0.057 | 0.035 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MFP | 1 | 0.066 | 0.066 | 0.066 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | FP  | 1 | 0.011 | 0.011 | 0.011 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1 | 0.039 | 0.039 | 0.039 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MOB | 2 | 0.017 | 0.067 | 0.042 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | FP  | 1 | 0.060 | 0.060 | 0.060 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | FP  | 1 | 0.056 | 0.056 | 0.056 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 3 | 0.015 | 0.173 | 0.072 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 1 | 0.030 | 0.030 | 0.030 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 2 | 0.023 | 0.134 | 0.078 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MOB | 1 | 0.100 | 0.100 | 0.100 |

### **Fox 3-9 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min<br>Range | Max<br>Range | Avg<br>Range |
|------|--------------|--------------|--------------|--------|-------|--------------|--------------|--------------|
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 192   | 0.068        | 0.190        | 0.136        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MOB    | 12    | 0.103        | 0.180        | 0.133        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 393   | 0.067        | 0.185        | 0.131        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 445   | 0.054        | 0.186        | 0.130        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1505  | 0.057        | 0.195        | 0.143        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2478  | 0.063        | 0.185        | 0.137        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 355   | 0.063        | 0.185        | 0.133        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MFP    | 20    | 0.085        | 0.176        | 0.130        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 9     | 0.081        | 0.184        | 0.133        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MFP    | 3     | 0.097        | 0.145        | 0.127        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 58    | 0.086        | 0.181        | 0.129        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 37    | 0.078        | 0.175        | 0.123        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 51    | 0.078        | 0.183        | 0.139        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 7     | 0.072        | 0.144        | 0.113        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 11    | 0.084        | 0.170        | 0.133        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 67    | 0.079        | 0.180        | 0.139        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 50    | 0.078        | 0.180        | 0.135        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 20    | 0.077        | 0.168        | 0.126        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 37    | 0.058        | 0.192        | 0.119        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 20    | 0.092        | 0.175        | 0.151        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 6     | 0.140        | 0.178        | 0.163        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MFP    | 3     | 0.063        | 0.161        | 0.116        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 16    | 0.102        | 0.184        | 0.148        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 5988  | 0.005        | 0.051        | 0.039        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 238   | 0.006        | 0.050        | 0.035        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 80    | 0.006        | 0.046        | 0.030        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 67    | 0.010        | 0.047        | 0.030        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 14    | 0.110        | 0.183        | 0.135        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 9     | 0.083        | 0.166        | 0.113        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 22    | 0.076        | 0.175        | 0.113        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 9     | 0.079        | 0.185        | 0.131        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 2     | 0.110        | 0.115        | 0.112        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 7     | 0.081        | 0.141        | 0.109        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 15    | 0.060        | 0.156        | 0.110        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 10    | 0.078        | 0.157        | 0.108        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MOB    | 1     | 0.084        | 0.084        | 0.084        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 8     | 0.076        | 0.154        | 0.117        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MOB    | 2     | 0.093        | 0.112        | 0.102        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 5     | 0.098        | 0.184        | 0.150        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 4     | 0.078        | 0.177        | 0.121        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 11    | 0.074        | 0.173        | 0.118        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 7     | 0.109        | 0.168        | 0.146        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | FP     | 1     | 0.068        | 0.068        | 0.068        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 13    | 0.057        | 0.171        | 0.123        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MOB    | 4     | 0.013        | 0.048        | 0.027        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 50    | 0.015        | 0.050        | 0.038        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | FP     | 2     | 0.084        | 0.175        | 0.130        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | FP     | 1     | 0.080        | 0.080        | 0.080        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MFP    | 2     | 0.120        | 0.165        | 0.143        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MOB    | 3     | 0.099        | 0.150        | 0.131        |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MFP    | 4     | 0.085        | 0.141        | 0.122        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 3     | 0.145        | 0.161        | 0.154        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | FP     | 1     | 0.154        | 0.154        | 0.154        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 17    | 0.033        | 0.148        | 0.090        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 311   | 0.013        | 0.181        | 0.107        |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 24    | 0.057        | 0.128        | 0.111        |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 12 | 0.035 | 0.048 | 0.042 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | NE  | 11 | 0.028 | 0.050 | 0.039 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MS  | 11 | 0.001 | 0.045 | 0.021 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | NE  | 3  | 0.035 | 0.048 | 0.040 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | KK  | 6  | 0.034 | 0.050 | 0.041 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | FP  | 1  | 0.047 | 0.047 | 0.047 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | MS  | 2  | 0.028 | 0.029 | 0.028 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 3  | 0.045 | 0.094 | 0.072 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 7  | 0.015 | 0.111 | 0.067 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MS  | 7  | 0.031 | 0.047 | 0.038 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 1  | 0.063 | 0.063 | 0.063 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MS  | 97 | 0.022 | 0.147 | 0.106 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | NE  | 1  | 0.028 | 0.028 | 0.028 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MOB | 1  | 0.014 | 0.014 | 0.014 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MS  | 51 | 0.009 | 0.129 | 0.107 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MS  | 32 | 0.019 | 0.193 | 0.103 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 2  | 0.117 | 0.124 | 0.120 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MS  | 26 | 0.051 | 0.206 | 0.107 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 4  | 0.023 | 0.115 | 0.085 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MOB | 1  | 0.090 | 0.090 | 0.090 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MS  | 11 | 0.089 | 0.192 | 0.119 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 2  | 0.092 | 0.101 | 0.097 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MFP | 1  | 0.082 | 0.082 | 0.082 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 7  | 0.030 | 0.163 | 0.102 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 4  | 0.057 | 0.129 | 0.104 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | KK  | 12 | 0.009 | 0.176 | 0.076 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | FP  | 1  | 0.111 | 0.111 | 0.111 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 2  | 0.067 | 0.122 | 0.095 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | KK  | 2  | 0.039 | 0.071 | 0.055 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 5  | 0.008 | 0.209 | 0.127 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MFP | 12 | 0.035 | 0.212 | 0.081 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | MFP | 2  | 0.031 | 0.038 | 0.035 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | NE  | 6  | 0.012 | 0.036 | 0.024 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 3  | 0.028 | 0.052 | 0.043 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MFP | 5  | 0.021 | 0.041 | 0.028 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | DUD | 2  | 0.035 | 0.070 | 0.052 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | MS  | 13 | 0.019 | 0.050 | 0.032 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 2  | 0.029 | 0.039 | 0.034 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 1  | 0.065 | 0.065 | 0.065 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | KK  | 1  | 0.049 | 0.049 | 0.049 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 3  | 0.016 | 0.060 | 0.032 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MOB | 1  | 0.059 | 0.059 | 0.059 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MOB | 1  | 0.054 | 0.054 | 0.054 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MOB | 2  | 0.058 | 0.064 | 0.061 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873   | FP  | 1  | 0.044 | 0.044 | 0.044 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | NE  | 2  | 0.045 | 0.048 | 0.046 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873   | MFP | 1  | 0.028 | 0.028 | 0.028 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MFP | 3  | 0.011 | 0.083 | 0.059 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 4  | 0.055 | 0.198 | 0.120 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873   | KK  | 1  | 0.043 | 0.043 | 0.043 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873   | KK  | 1  | 0.046 | 0.046 | 0.046 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MFP | 3  | 0.025 | 0.051 | 0.042 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MFP | 1  | 0.017 | 0.017 | 0.017 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 1  | 0.071 | 0.071 | 0.071 |

### Fox 3-10 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 327   | 0.057     | 0.185     | 0.132     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 1403  | 0.074     | 0.194     | 0.140     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 384   | 0.057     | 0.190     | 0.129     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 394   | 0.059     | 0.197     | 0.130     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 2397  | 0.060     | 0.194     | 0.134     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 52    | 0.056     | 0.176     | 0.122     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 9     | 0.088     | 0.160     | 0.126     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 6     | 0.079     | 0.184     | 0.137     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 21    | 0.085     | 0.182     | 0.125     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 19    | 0.061     | 0.174     | 0.113     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 179   | 0.061     | 0.190     | 0.128     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MFP    | 8     | 0.076     | 0.173     | 0.133     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 16    | 0.060     | 0.165     | 0.099     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 50    | 0.087     | 0.177     | 0.127     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MOB    | 2     | 0.126     | 0.126     | 0.126     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 79    | 0.093     | 0.186     | 0.133     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | FP     | 13    | 0.085     | 0.174     | 0.116     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MFP    | 5     | 0.099     | 0.155     | 0.129     |

|   |              |              |              |     |      |       |       |       |
|---|--------------|--------------|--------------|-----|------|-------|-------|-------|
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MFP | 30   | 0.081 | 0.179 | 0.128 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 12   | 0.097 | 0.180 | 0.138 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 8    | 0.089 | 0.169 | 0.132 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 3    | 0.096 | 0.147 | 0.117 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 12   | 0.058 | 0.152 | 0.097 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 16   | 0.101 | 0.185 | 0.139 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 5344 | 0.006 | 0.051 | 0.039 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 251  | 0.001 | 0.050 | 0.034 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 63   | 0.009 | 0.050 | 0.031 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 14   | 0.105 | 0.172 | 0.133 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MOB | 8    | 0.095 | 0.150 | 0.121 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 37   | 0.083 | 0.183 | 0.135 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 8    | 0.070 | 0.167 | 0.120 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP | 23   | 0.074 | 0.178 | 0.126 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 17   | 0.069 | 0.173 | 0.121 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 3    | 0.091 | 0.166 | 0.128 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 15   | 0.075 | 0.186 | 0.131 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | FP  | 1    | 0.093 | 0.093 | 0.093 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 8    | 0.083 | 0.170 | 0.113 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 21   | 0.081 | 0.175 | 0.123 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 13   | 0.078 | 0.164 | 0.122 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 8    | 0.075 | 0.170 | 0.120 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 3    | 0.098 | 0.173 | 0.124 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 58   | 0.010 | 0.050 | 0.031 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MOB | 1    | 0.107 | 0.107 | 0.107 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 6    | 0.075 | 0.172 | 0.125 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 53   | 0.004 | 0.050 | 0.037 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MFP | 1    | 0.092 | 0.092 | 0.092 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MFP | 4    | 0.070 | 0.169 | 0.135 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | MOB | 1    | 0.063 | 0.063 | 0.063 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | FP  | 2    | 0.106 | 0.166 | 0.136 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 2    | 0.041 | 0.043 | 0.042 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | FP  | 1    | 0.148 | 0.148 | 0.148 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 3    | 0.114 | 0.177 | 0.148 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 344  | 0.009 | 0.234 | 0.114 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 19   | 0.015 | 0.227 | 0.072 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 74   | 0.033 | 0.216 | 0.109 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 22   | 0.024 | 0.127 | 0.104 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 45   | 0.007 | 0.222 | 0.110 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 3    | 0.115 | 0.127 | 0.121 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 8    | 0.009 | 0.259 | 0.082 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 5    | 0.030 | 0.262 | 0.111 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 33   | 0.025 | 0.255 | 0.113 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 25   | 0.012 | 0.250 | 0.113 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 7    | 0.019 | 0.261 | 0.119 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | FP  | 2    | 0.101 | 0.104 | 0.103 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 11   | 0.041 | 0.141 | 0.102 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 1    | 0.131 | 0.131 | 0.131 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 1    | 0.104 | 0.104 | 0.104 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 13   | 0.022 | 0.125 | 0.092 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 4    | 0.022 | 0.105 | 0.068 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MOB | 1    | 0.121 | 0.121 | 0.121 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 9    | 0.007 | 0.269 | 0.204 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MFP | 3    | 0.036 | 0.108 | 0.077 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 8    | 0.018 | 0.253 | 0.120 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 2    | 0.096 | 0.111 | 0.104 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 5    | 0.021 | 0.079 | 0.048 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 21   | 0.017 | 0.216 | 0.090 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 3    | 0.019 | 0.042 | 0.028 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | FP  | 1    | 0.042 | 0.042 | 0.042 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 7    | 0.023 | 0.192 | 0.068 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | NE  | 2    | 0.021 | 0.021 | 0.021 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | KK  | 1    | 0.023 | 0.023 | 0.023 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MFP | 3    | 0.019 | 0.044 | 0.036 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | FP  | 1    | 0.022 | 0.022 | 0.022 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 2    | 0.104 | 0.118 | 0.111 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MFP | 3    | 0.033 | 0.129 | 0.086 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 2    | 0.031 | 0.110 | 0.070 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MFP | 1    | 0.076 | 0.076 | 0.076 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | KK  | 1    | 0.020 | 0.020 | 0.020 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MOB | 3    | 0.023 | 0.162 | 0.081 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | NE  | 2    | 0.027 | 0.041 | 0.034 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | MS  | 10   | 0.029 | 0.044 | 0.037 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MFP | 8    | 0.025 | 0.178 | 0.069 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | NE  | 1    | 0.016 | 0.016 | 0.016 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MFP | 1    | 0.021 | 0.021 | 0.021 |
| 2 | Cav w/Spring | Indian w/Spr | Colt 1873    | MOB | 1    | 0.023 | 0.023 | 0.023 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873    | KK  | 2    | 0.018 | 0.020 | 0.019 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873    | FP  | 1    | 0.035 | 0.035 | 0.035 |

|   |              |              |             |     |   |       |       |       |
|---|--------------|--------------|-------------|-----|---|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MS  | 6 | 0.021 | 0.045 | 0.039 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | MFP | 1 | 0.037 | 0.037 | 0.037 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | FP  | 4 | 0.018 | 0.070 | 0.040 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 4 | 0.032 | 0.242 | 0.091 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | FP  | 1 | 0.023 | 0.023 | 0.023 |
| 2 | Cav w/Spring | Indian w/Bow | Colt 1873   | KK  | 1 | 0.032 | 0.032 | 0.032 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | FP  | 1 | 0.048 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MFP | 2 | 0.041 | 0.053 | 0.047 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MOB | 1 | 0.041 | 0.041 | 0.041 |
| 2 | Cav w/Spring | Indian w/Rif | Colt 1873   | NE  | 3 | 0.018 | 0.020 | 0.019 |
| 2 | Cav w/Spring | Indian w/Sha | Colt 1873   | MOB | 1 | 0.005 | 0.005 | 0.005 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MOB | 1 | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 2 | 0.072 | 0.198 | 0.135 |

### 3. Gray

#### Gray 3-1 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 226   | 0.063     | 0.301     | 0.156     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 826   | 0.058     | 0.248     | 0.126     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 933   | 0.064     | 0.206     | 0.119     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 222   | 0.059     | 0.343     | 0.169     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 27    | 0.064     | 0.275     | 0.131     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 190   | 0.065     | 0.284     | 0.137     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 22    | 0.066     | 0.256     | 0.154     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 7     | 0.081     | 0.255     | 0.154     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 76    | 0.064     | 0.245     | 0.114     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 8     | 0.099     | 0.262     | 0.171     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 104   | 0.060     | 0.326     | 0.168     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 21    | 0.064     | 0.166     | 0.116     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 7     | 0.087     | 0.146     | 0.116     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 26    | 0.069     | 0.173     | 0.112     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 10    | 0.088     | 0.200     | 0.134     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 31    | 0.058     | 0.203     | 0.106     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 283   | 0.025     | 0.050     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 12    | 0.034     | 0.050     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 3     | 0.032     | 0.049     | 0.039     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 8     | 0.028     | 0.045     | 0.037     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 3     | 0.022     | 0.039     | 0.031     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 11    | 0.070     | 0.176     | 0.105     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 9     | 0.102     | 0.281     | 0.148     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 33    | 0.074     | 0.187     | 0.115     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 5     | 0.083     | 0.170     | 0.117     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 27    | 0.088     | 0.209     | 0.126     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 7     | 0.085     | 0.285     | 0.185     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 15    | 0.068     | 0.176     | 0.105     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 13    | 0.062     | 0.255     | 0.125     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 14    | 0.062     | 0.178     | 0.100     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 4     | 0.100     | 0.177     | 0.132     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 9     | 0.090     | 0.237     | 0.151     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 6     | 0.075     | 0.170     | 0.132     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 2     | 0.131     | 0.244     | 0.187     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 3     | 0.153     | 0.259     | 0.220     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 7     | 0.106     | 0.245     | 0.155     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 2     | 0.127     | 0.256     | 0.192     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 2     | 0.159     | 0.178     | 0.168     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 120   | 0.072     | 0.247     | 0.127     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | KK     | 12    | 0.061     | 0.237     | 0.148     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 162   | 0.070     | 0.265     | 0.162     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 108   | 0.067     | 0.255     | 0.145     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 48    | 0.060     | 0.247     | 0.178     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 29    | 0.070     | 0.250     | 0.143     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 109   | 0.065     | 0.256     | 0.142     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 40    | 0.059     | 0.242     | 0.131     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 8     | 0.077     | 0.239     | 0.120     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | DUD    | 2     | 0.119     | 0.236     | 0.177     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 10    | 0.067     | 0.245     | 0.207     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 43    | 0.062     | 0.254     | 0.181     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 138   | 0.071     | 0.228     | 0.119     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 48    | 0.061     | 0.248     | 0.167     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | KK     | 16    | 0.073     | 0.249     | 0.187     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | DUD    | 4     | 0.073     | 0.237     | 0.162     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | SUS    | 21    | 0.071     | 0.241     | 0.182     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | SUS    | 13    | 0.055     | 0.239     | 0.211     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 69    | 0.057     | 0.226     | 0.117     |

|   |              |              |             |     |    |       |       |       |
|---|--------------|--------------|-------------|-----|----|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 10 | 0.074 | 0.221 | 0.152 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 17 | 0.074 | 0.252 | 0.190 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | DUD | 1  | 0.199 | 0.199 | 0.199 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 4  | 0.221 | 0.259 | 0.234 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 49 | 0.055 | 0.239 | 0.169 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 6  | 0.071 | 0.249 | 0.203 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 2  | 0.096 | 0.230 | 0.163 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | SUS | 18 | 0.059 | 0.236 | 0.167 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | TL  | 1  | 0.237 | 0.237 | 0.237 |

### Gray 3-2 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 197   | 0.057     | 0.278     | 0.141     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 18    | 0.093     | 0.157     | 0.123     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 238   | 0.059     | 0.269     | 0.142     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1191  | 0.062     | 0.185     | 0.129     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 260   | 0.052     | 0.262     | 0.140     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 88    | 0.072     | 0.264     | 0.145     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 971   | 0.053     | 0.225     | 0.129     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 17    | 0.071     | 0.256     | 0.138     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 25    | 0.055     | 0.253     | 0.130     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 15    | 0.062     | 0.249     | 0.134     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 82    | 0.062     | 0.248     | 0.110     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 16    | 0.075     | 0.202     | 0.120     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 45    | 0.078     | 0.184     | 0.135     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 22    | 0.063     | 0.171     | 0.115     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 5     | 0.113     | 0.162     | 0.135     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 16    | 0.095     | 0.184     | 0.139     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 283   | 0.020     | 0.050     | 0.041     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 8     | 0.025     | 0.044     | 0.036     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 2     | 0.038     | 0.038     | 0.038     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 3     | 0.043     | 0.049     | 0.046     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 8     | 0.027     | 0.047     | 0.041     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 1     | 0.119     | 0.119     | 0.119     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 8     | 0.074     | 0.138     | 0.094     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 32    | 0.041     | 0.182     | 0.124     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 7     | 0.085     | 0.225     | 0.136     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 9     | 0.077     | 0.172     | 0.129     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 27    | 0.071     | 0.250     | 0.135     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 24    | 0.055     | 0.235     | 0.131     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 13    | 0.094     | 0.177     | 0.146     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 10    | 0.065     | 0.233     | 0.129     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 6     | 0.099     | 0.261     | 0.198     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 3     | 0.084     | 0.167     | 0.134     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 3     | 0.097     | 0.222     | 0.168     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 2     | 0.180     | 0.262     | 0.221     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 3     | 0.095     | 0.180     | 0.151     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 4     | 0.044     | 0.255     | 0.141     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 1     | 0.289     | 0.289     | 0.289     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 3     | 0.149     | 0.179     | 0.160     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 70    | 0.061     | 0.250     | 0.162     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 174   | 0.063     | 0.261     | 0.121     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | KK     | 22    | 0.104     | 0.228     | 0.167     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 85    | 0.077     | 0.270     | 0.157     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 54    | 0.070     | 0.264     | 0.128     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 102   | 0.058     | 0.268     | 0.143     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 21    | 0.081     | 0.213     | 0.140     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | KK     | 4     | 0.111     | 0.229     | 0.199     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 19    | 0.078     | 0.264     | 0.213     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 119   | 0.080     | 0.205     | 0.125     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 2     | 0.102     | 0.241     | 0.171     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | DUD    | 5     | 0.092     | 0.266     | 0.195     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 9     | 0.077     | 0.237     | 0.172     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | SUS    | 2     | 0.086     | 0.233     | 0.160     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 13    | 0.082     | 0.265     | 0.212     |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | TL     | 1     | 0.116     | 0.116     | 0.116     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 8     | 0.078     | 0.182     | 0.117     |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | TL     | 1     | 0.165     | 0.165     | 0.165     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 8     | 0.151     | 0.260     | 0.231     |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | DUD    | 3     | 0.125     | 0.250     | 0.170     |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | DUD    | 1     | 0.112     | 0.112     | 0.112     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 2     | 0.097     | 0.196     | 0.147     |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 2     | 0.086     | 0.135     | 0.111     |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 2     | 0.109     | 0.254     | 0.182     |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | SUS    | 3     | 0.149     | 0.247     | 0.214     |

|   |              |              |             |     |   |       |       |       |
|---|--------------|--------------|-------------|-----|---|-------|-------|-------|
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 4 | 0.131 | 0.218 | 0.153 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 2 | 0.245 | 0.265 | 0.255 |

### **Gray 3-3 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min<br>Range | Max<br>Range | Avg<br>Range |
|------|--------------|--------------|--------------|--------|-------|--------------|--------------|--------------|
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 17    | 0.072        | 0.263        | 0.136        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 195   | 0.045        | 0.304        | 0.157        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 22    | 0.075        | 0.268        | 0.137        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 215   | 0.050        | 0.304        | 0.165        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 84    | 0.051        | 0.161        | 0.100        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 19    | 0.072        | 0.175        | 0.107        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 739   | 0.062        | 0.185        | 0.114        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 806   | 0.059        | 0.248        | 0.126        |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | KK     | 24    | 0.044        | 0.207        | 0.107        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 76    | 0.072        | 0.289        | 0.144        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 14    | 0.091        | 0.249        | 0.149        |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | MS     | 146   | 0.054        | 0.274        | 0.138        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 28    | 0.075        | 0.182        | 0.131        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 5     | 0.101        | 0.224        | 0.154        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 12    | 0.098        | 0.178        | 0.139        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 544   | 0.031        | 0.051        | 0.043        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 21    | 0.034        | 0.049        | 0.044        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 5     | 0.040        | 0.044        | 0.042        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 9     | 0.031        | 0.046        | 0.041        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 27    | 0.071        | 0.162        | 0.109        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 21    | 0.057        | 0.246        | 0.107        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 23    | 0.069        | 0.192        | 0.111        |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 13    | 0.089        | 0.159        | 0.122        |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | DUD    | 11    | 0.086        | 0.234        | 0.149        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 5     | 0.077        | 0.272        | 0.145        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 15    | 0.079        | 0.256        | 0.136        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 7     | 0.131        | 0.282        | 0.218        |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | TL     | 2     | 0.087        | 0.145        | 0.116        |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 4     | 0.078        | 0.184        | 0.138        |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | SUS    | 5     | 0.079        | 0.208        | 0.149        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 6     | 0.097        | 0.195        | 0.144        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 7     | 0.083        | 0.235        | 0.135        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 3     | 0.098        | 0.203        | 0.163        |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 2     | 0.041        | 0.046        | 0.043        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 1     | 0.132        | 0.132        | 0.132        |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 3     | 0.102        | 0.107        | 0.104        |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 4     | 0.090        | 0.265        | 0.193        |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 2     | 0.121        | 0.170        | 0.145        |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 162   | 0.068        | 0.258        | 0.165        |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | KK     | 17    | 0.083        | 0.208        | 0.168        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 121   | 0.062        | 0.236        | 0.153        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 27    | 0.071        | 0.219        | 0.180        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 99    | 0.068        | 0.220        | 0.119        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 120   | 0.058        | 0.228        | 0.147        |
| 2    | Cav w/Spring | Indian w/Sho | Springfield  | MS     | 30    | 0.075        | 0.194        | 0.130        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 41    | 0.073        | 0.222        | 0.176        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 30    | 0.069        | 0.220        | 0.140        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 6     | 0.102        | 0.220        | 0.185        |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 3     | 0.081        | 0.213        | 0.126        |
| 2    | Cav w/Spring | Indian w/Sho | Springfield  | SUS    | 4     | 0.090        | 0.208        | 0.173        |
| 2    | Cav w/Spring | Indian w/Sho | Springfield  | KK     | 13    | 0.073        | 0.222        | 0.178        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 84    | 0.068        | 0.230        | 0.134        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 32    | 0.069        | 0.225        | 0.181        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | DUD    | 4     | 0.122        | 0.196        | 0.147        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | DUD    | 1     | 0.131        | 0.131        | 0.131        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 7     | 0.073        | 0.106        | 0.092        |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | DUD    | 4     | 0.127        | 0.202        | 0.165        |
| 2    | Cav w/Spring | Indian w/Sho | Springfield  | DUD    | 2     | 0.080        | 0.195        | 0.138        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 6     | 0.076        | 0.192        | 0.126        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | KK     | 10    | 0.072        | 0.208        | 0.170        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 13    | 0.139        | 0.222        | 0.193        |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 2     | 0.095        | 0.098        | 0.096        |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | SUS    | 5     | 0.166        | 0.205        | 0.181        |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | SUS    | 6     | 0.173        | 0.217        | 0.186        |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | SUS    | 1     | 0.171        | 0.171        | 0.171        |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | DUD    | 5     | 0.194        | 0.223        | 0.207        |

### **Gray 3-4 Direct Fire Effects**

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min   | Max   | Avg   |
|------|--------------|--------------|--------------|--------|-------|-------|-------|-------|
|      |              |              |              |        |       | Range | Range | Range |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 999   | 0.057 | 0.249 | 0.122 |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 245   | 0.045 | 0.305 | 0.160 |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 212   | 0.048 | 0.300 | 0.152 |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 88    | 0.060 | 0.312 | 0.150 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 832   | 0.056 | 0.211 | 0.123 |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 83    | 0.060 | 0.248 | 0.109 |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 36    | 0.077 | 0.178 | 0.118 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 20    | 0.056 | 0.176 | 0.117 |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 187   | 0.052 | 0.278 | 0.141 |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 3     | 0.098 | 0.168 | 0.131 |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 25    | 0.079 | 0.266 | 0.138 |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 2     | 0.106 | 0.113 | 0.109 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 11    | 0.077 | 0.180 | 0.141 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 5     | 0.105 | 0.168 | 0.127 |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 584   | 0.022 | 0.050 | 0.042 |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 28    | 0.030 | 0.048 | 0.041 |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MFP    | 7     | 0.033 | 0.043 | 0.040 |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 4     | 0.019 | 0.048 | 0.034 |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | TL     | 10    | 0.029 | 0.048 | 0.042 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 25    | 0.099 | 0.192 | 0.121 |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 12    | 0.085 | 0.246 | 0.116 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 25    | 0.073 | 0.181 | 0.113 |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 28    | 0.025 | 0.262 | 0.117 |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 8     | 0.105 | 0.166 | 0.138 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 16    | 0.063 | 0.142 | 0.116 |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 6     | 0.108 | 0.274 | 0.173 |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 7     | 0.069 | 0.166 | 0.110 |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 18    | 0.080 | 0.144 | 0.109 |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 1     | 0.104 | 0.104 | 0.104 |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 6     | 0.110 | 0.270 | 0.152 |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 10    | 0.099 | 0.255 | 0.143 |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 5     | 0.146 | 0.234 | 0.204 |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 5     | 0.124 | 0.275 | 0.218 |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 4     | 0.065 | 0.143 | 0.108 |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 4     | 0.052 | 0.177 | 0.139 |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 5     | 0.102 | 0.278 | 0.168 |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 1     | 0.190 | 0.190 | 0.190 |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | TL     | 2     | 0.179 | 0.183 | 0.181 |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | KK     | 15    | 0.062 | 0.203 | 0.157 |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | MS     | 100   | 0.065 | 0.219 | 0.135 |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | MS     | 121   | 0.045 | 0.216 | 0.117 |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | KK     | 6     | 0.101 | 0.192 | 0.138 |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | MS     | 37    | 0.039 | 0.201 | 0.122 |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | MS     | 60    | 0.065 | 0.218 | 0.132 |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | MS     | 78    | 0.062 | 0.245 | 0.154 |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | SUS    | 5     | 0.097 | 0.169 | 0.140 |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | DUD    | 6     | 0.103 | 0.126 | 0.116 |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | SUS    | 9     | 0.108 | 0.202 | 0.169 |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | DUD    | 3     | 0.084 | 0.116 | 0.101 |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | MS     | 21    | 0.079 | 0.216 | 0.126 |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | MS     | 154   | 0.044 | 0.221 | 0.132 |
| 2    | Cav w/Spring | Indian w/Win | Springfield  | KK     | 29    | 0.080 | 0.203 | 0.158 |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | KK     | 4     | 0.085 | 0.187 | 0.154 |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | DUD    | 5     | 0.117 | 0.197 | 0.155 |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | DUD    | 4     | 0.083 | 0.239 | 0.132 |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | DUD    | 4     | 0.072 | 0.169 | 0.129 |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | SUS    | 1     | 0.109 | 0.109 | 0.109 |
| 2    | Cav w/Spring | Indian w/Spr | Springfield  | DUD    | 2     | 0.123 | 0.150 | 0.136 |
| 2    | Cav w/Spring | Indian w/Rif | Springfield  | DUD    | 4     | 0.109 | 0.147 | 0.131 |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | KK     | 13    | 0.044 | 0.182 | 0.136 |
| 2    | Cav w/Spring | Indian w/Hen | Springfield  | KK     | 13    | 0.097 | 0.176 | 0.150 |
| 2    | Cav w/Spring | Indian w/Sha | Springfield  | SUS    | 4     | 0.092 | 0.193 | 0.148 |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | KK     | 13    | 0.041 | 0.180 | 0.083 |
| 2    | Cav w/Spring | Indian w/Bow | Springfield  | SUS    | 2     | 0.093 | 0.111 | 0.102 |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | MS     | 7     | 0.040 | 0.043 | 0.042 |
| 2    | Cav w/Spring | Indian w/Bow | Colt 1873    | KK     | 2     | 0.043 | 0.046 | 0.044 |
| 2    | Cav w/Spring | Indian w/Smo | Springfield  | SUS    | 4     | 0.178 | 0.183 | 0.180 |

### Gray 3-5 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min   | Max   | Avg   |
|------|--------------|--------------|--------------|--------|-------|-------|-------|-------|
|      |              |              |              |        |       | Range | Range | Range |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 938   | 0.064 | 0.249 | 0.122 |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 217   | 0.062 | 0.322 | 0.146 |

|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MS  | 202 | 0.027 | 0.277 | 0.126 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS  | 786 | 0.051 | 0.195 | 0.120 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | KK  | 73  | 0.021 | 0.247 | 0.111 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | SUS | 22  | 0.077 | 0.248 | 0.129 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 15  | 0.110 | 0.184 | 0.139 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MS  | 228 | 0.045 | 0.308 | 0.154 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 26  | 0.063 | 0.263 | 0.131 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MS  | 102 | 0.061 | 0.307 | 0.146 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 5   | 0.053 | 0.141 | 0.101 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 29  | 0.054 | 0.184 | 0.123 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 45  | 0.052 | 0.197 | 0.111 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 25  | 0.067 | 0.266 | 0.129 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 25  | 0.084 | 0.178 | 0.117 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 11  | 0.098 | 0.169 | 0.135 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 383 | 0.021 | 0.050 | 0.041 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 18  | 0.026 | 0.050 | 0.038 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 4   | 0.034 | 0.050 | 0.043 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 3   | 0.021 | 0.047 | 0.035 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 30  | 0.061 | 0.271 | 0.132 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 10  | 0.065 | 0.303 | 0.165 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 15  | 0.084 | 0.260 | 0.165 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 3   | 0.078 | 0.217 | 0.139 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 21  | 0.054 | 0.246 | 0.112 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP | 11  | 0.064 | 0.202 | 0.111 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 3   | 0.076 | 0.165 | 0.116 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 5   | 0.080 | 0.170 | 0.123 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 5   | 0.074 | 0.176 | 0.133 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 14  | 0.071 | 0.230 | 0.133 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 4   | 0.078 | 0.119 | 0.096 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 8   | 0.100 | 0.221 | 0.130 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 8   | 0.114 | 0.272 | 0.216 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 1   | 0.254 | 0.254 | 0.254 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 2   | 0.209 | 0.234 | 0.222 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 2   | 0.180 | 0.181 | 0.181 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 5   | 0.027 | 0.045 | 0.037 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 1   | 0.158 | 0.158 | 0.158 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 7   | 0.074 | 0.167 | 0.108 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 106 | 0.060 | 0.231 | 0.124 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 131 | 0.065 | 0.246 | 0.141 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 23  | 0.076 | 0.179 | 0.106 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 126 | 0.061 | 0.195 | 0.114 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 28  | 0.079 | 0.214 | 0.131 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 91  | 0.040 | 0.192 | 0.114 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 8   | 0.071 | 0.142 | 0.098 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | MS  | 1   | 0.036 | 0.036 | 0.036 |
| 2 | Cav w/Spring | Indian w/Smo | Colt 1873    | KK  | 1   | 0.038 | 0.038 | 0.038 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 28  | 0.065 | 0.120 | 0.089 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 6   | 0.080 | 0.120 | 0.103 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 24  | 0.070 | 0.142 | 0.100 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 43  | 0.068 | 0.203 | 0.112 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 4   | 0.093 | 0.120 | 0.110 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 5   | 0.085 | 0.163 | 0.128 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | DUD | 2   | 0.074 | 0.083 | 0.079 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 175 | 0.062 | 0.236 | 0.127 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 87  | 0.062 | 0.159 | 0.092 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 6   | 0.097 | 0.211 | 0.145 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 6   | 0.075 | 0.127 | 0.104 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 1   | 0.102 | 0.102 | 0.102 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 2   | 0.072 | 0.079 | 0.075 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 8   | 0.068 | 0.165 | 0.107 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 12  | 0.069 | 0.195 | 0.119 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | TL  | 2   | 0.126 | 0.169 | 0.147 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | TL  | 1   | 0.172 | 0.172 | 0.172 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 20  | 0.067 | 0.153 | 0.096 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | TL  | 1   | 0.172 | 0.172 | 0.172 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 11  | 0.072 | 0.141 | 0.098 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | TL  | 1   | 0.067 | 0.067 | 0.067 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 2   | 0.084 | 0.084 | 0.084 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | TL  | 2   | 0.082 | 0.126 | 0.104 |
| 2 | Cav w/Spring | Indian w/Hen | Colt 1873    | KK  | 1   | 0.037 | 0.037 | 0.037 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 1   | 0.119 | 0.119 | 0.119 |

### Gray 3-6 Direct Fire Effects

| Side | Shooter      | Target       | Ammo        | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|-------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | Cav w/Spring | Springfield | MS     | 222   | 0.063     | 0.284     | 0.138     |



|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | MS  | 211 | 0.069 | 0.286 | 0.148 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS  | 886 | 0.059 | 0.243 | 0.129 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | SUS | 11  | 0.073 | 0.243 | 0.119 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 7   | 0.097 | 0.180 | 0.132 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MS  | 925 | 0.040 | 0.248 | 0.121 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | KK  | 93  | 0.036 | 0.187 | 0.104 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 12  | 0.086 | 0.265 | 0.167 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 28  | 0.045 | 0.263 | 0.117 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | MS  | 211 | 0.048 | 0.260 | 0.136 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 35  | 0.063 | 0.194 | 0.103 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 39  | 0.074 | 0.184 | 0.116 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MS  | 93  | 0.060 | 0.281 | 0.144 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 10  | 0.114 | 0.187 | 0.149 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 3   | 0.071 | 0.119 | 0.094 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 25  | 0.078 | 0.177 | 0.130 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 22  | 0.070 | 0.224 | 0.133 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 6   | 0.097 | 0.179 | 0.132 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 30  | 0.062 | 0.268 | 0.128 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 9   | 0.084 | 0.262 | 0.139 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 5   | 0.083 | 0.256 | 0.143 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 18  | 0.079 | 0.211 | 0.122 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 3   | 0.077 | 0.147 | 0.117 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 2   | 0.107 | 0.119 | 0.113 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP | 6   | 0.081 | 0.110 | 0.102 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 2   | 0.070 | 0.221 | 0.145 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 3   | 0.108 | 0.199 | 0.168 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | TL  | 3   | 0.090 | 0.175 | 0.142 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 1   | 0.225 | 0.225 | 0.225 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 210 | 0.045 | 0.051 | 0.047 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 1   | 0.082 | 0.082 | 0.082 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 10  | 0.045 | 0.050 | 0.046 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 1   | 0.046 | 0.046 | 0.046 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 1   | 0.046 | 0.046 | 0.046 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 1   | 0.046 | 0.046 | 0.046 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 2   | 0.046 | 0.046 | 0.046 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 5   | 0.055 | 0.238 | 0.180 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 4   | 0.106 | 0.170 | 0.138 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 2   | 0.124 | 0.265 | 0.195 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 71  | 0.071 | 0.228 | 0.134 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 15  | 0.103 | 0.170 | 0.136 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 111 | 0.073 | 0.210 | 0.122 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 37  | 0.082 | 0.199 | 0.124 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 81  | 0.063 | 0.200 | 0.132 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 29  | 0.071 | 0.245 | 0.144 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | DUD | 3   | 0.125 | 0.249 | 0.190 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 108 | 0.079 | 0.200 | 0.132 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 4   | 0.057 | 0.124 | 0.099 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 20  | 0.064 | 0.191 | 0.146 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 99  | 0.074 | 0.253 | 0.150 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 33  | 0.084 | 0.134 | 0.124 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 4   | 0.104 | 0.156 | 0.125 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 5   | 0.086 | 0.197 | 0.119 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 4   | 0.100 | 0.146 | 0.122 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 9   | 0.112 | 0.163 | 0.138 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 5   | 0.095 | 0.167 | 0.130 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 4   | 0.101 | 0.185 | 0.138 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | DUD | 1   | 0.173 | 0.173 | 0.173 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 3   | 0.135 | 0.181 | 0.152 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 23  | 0.066 | 0.176 | 0.137 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 6   | 0.123 | 0.175 | 0.156 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 1   | 0.142 | 0.142 | 0.142 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 2   | 0.112 | 0.183 | 0.148 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 8   | 0.121 | 0.134 | 0.129 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 2   | 0.125 | 0.129 | 0.127 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 1   | 0.163 | 0.163 | 0.163 |

### Gray 3-7 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 230   | 0.045     | 0.292     | 0.157     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 223   | 0.043     | 0.290     | 0.166     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 9     | 0.073     | 0.200     | 0.132     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 89    | 0.063     | 0.247     | 0.106     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 5     | 0.076     | 0.265     | 0.163     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 830   | 0.047     | 0.250     | 0.126     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 217   | 0.045     | 0.283     | 0.140     |

|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | MS  | 104 | 0.065 | 0.293 | 0.161 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | MS  | 932 | 0.056 | 0.249 | 0.120 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | SUS | 12  | 0.076 | 0.169 | 0.103 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 4   | 0.089 | 0.264 | 0.182 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | KK  | 27  | 0.066 | 0.267 | 0.121 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | DUD | 11  | 0.066 | 0.280 | 0.142 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | KK  | 23  | 0.014 | 0.262 | 0.146 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 12  | 0.096 | 0.184 | 0.151 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 2   | 0.076 | 0.129 | 0.102 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 29  | 0.072 | 0.184 | 0.122 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 10  | 0.034 | 0.048 | 0.044 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 234 | 0.025 | 0.050 | 0.042 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 4   | 0.034 | 0.043 | 0.040 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 2   | 0.025 | 0.046 | 0.036 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 4   | 0.041 | 0.048 | 0.045 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 26  | 0.085 | 0.183 | 0.122 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 38  | 0.053 | 0.187 | 0.108 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | KK  | 18  | 0.066 | 0.259 | 0.115 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL  | 11  | 0.087 | 0.178 | 0.132 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 23  | 0.072 | 0.188 | 0.112 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 4   | 0.021 | 0.268 | 0.123 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 13  | 0.069 | 0.200 | 0.116 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | SUS | 4   | 0.089 | 0.283 | 0.175 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 3   | 0.082 | 0.140 | 0.110 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 4   | 0.041 | 0.168 | 0.109 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 6   | 0.078 | 0.170 | 0.116 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 2   | 0.048 | 0.122 | 0.085 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | SUS | 1   | 0.081 | 0.081 | 0.081 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | TL  | 1   | 0.098 | 0.098 | 0.098 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 4   | 0.117 | 0.255 | 0.167 |
| 1 | Indian w/Sho | Cav w/Spring | Springfield  | TL  | 1   | 0.151 | 0.151 | 0.151 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 11  | 0.061 | 0.187 | 0.100 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 127 | 0.063 | 0.205 | 0.117 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | MS  | 40  | 0.038 | 0.198 | 0.122 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 73  | 0.062 | 0.215 | 0.121 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 17  | 0.070 | 0.229 | 0.136 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 1   | 0.111 | 0.111 | 0.111 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 1   | 0.116 | 0.116 | 0.116 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 68  | 0.065 | 0.247 | 0.135 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 61  | 0.056 | 0.288 | 0.154 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 12  | 0.066 | 0.201 | 0.109 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | DUD | 3   | 0.101 | 0.185 | 0.132 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 72  | 0.060 | 0.224 | 0.128 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 6   | 0.076 | 0.204 | 0.110 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 12  | 0.067 | 0.221 | 0.119 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 3   | 0.084 | 0.122 | 0.105 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 35  | 0.057 | 0.240 | 0.133 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 6   | 0.057 | 0.231 | 0.164 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 3   | 0.064 | 0.124 | 0.097 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 8   | 0.061 | 0.230 | 0.125 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 5   | 0.085 | 0.215 | 0.152 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 3   | 0.096 | 0.233 | 0.163 |
| 2 | Cav w/Spring | Indian w/Sho | Springfield  | KK  | 3   | 0.048 | 0.196 | 0.136 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | MS  | 1   | 0.048 | 0.048 | 0.048 |
| 2 | Cav w/Spring | Indian w/Win | Colt 1873    | NE  | 1   | 0.041 | 0.041 | 0.041 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 1   | 0.126 | 0.126 | 0.126 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 3   | 0.068 | 0.215 | 0.158 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 4   | 0.064 | 0.230 | 0.136 |

### Gray 3-8 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | MS     | 200   | 0.050     | 0.281     | 0.146     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 226   | 0.067     | 0.301     | 0.167     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 793   | 0.052     | 0.260     | 0.117     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 784   | 0.052     | 0.249     | 0.128     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 229   | 0.070     | 0.325     | 0.170     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 26    | 0.070     | 0.261     | 0.142     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 94    | 0.048     | 0.245     | 0.106     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 88    | 0.048     | 0.309     | 0.154     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 24    | 0.066     | 0.258     | 0.120     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 6     | 0.081     | 0.204     | 0.119     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 23    | 0.063     | 0.159     | 0.101     |
| 1    | Indian w/Sho | Cav w/Spring | Springfield  | KK     | 24    | 0.057     | 0.266     | 0.121     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 2     | 0.132     | 0.145     | 0.139     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 9     | 0.106     | 0.187     | 0.139     |

|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 17  | 0.052 | 0.211 | 0.126 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | TL  | 8   | 0.078 | 0.171 | 0.141 |
| 1 | Indian w/Win | Cav w/Spring | Winchester . | DUD | 28  | 0.088 | 0.248 | 0.123 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 11  | 0.096 | 0.242 | 0.132 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD | 17  | 0.081 | 0.192 | 0.138 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS | 25  | 0.055 | 0.193 | 0.104 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 7   | 0.071 | 0.171 | 0.118 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 5   | 0.076 | 0.203 | 0.134 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP | 7   | 0.055 | 0.199 | 0.119 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 6   | 0.100 | 0.258 | 0.152 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 6   | 0.080 | 0.275 | 0.162 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 6   | 0.095 | 0.176 | 0.120 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 4   | 0.074 | 0.267 | 0.150 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 4   | 0.169 | 0.265 | 0.215 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 5   | 0.196 | 0.263 | 0.234 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | DUD | 7   | 0.124 | 0.252 | 0.212 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MS  | 280 | 0.030 | 0.050 | 0.045 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | SUS | 13  | 0.031 | 0.049 | 0.044 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 1   | 0.158 | 0.158 | 0.158 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 1   | 0.047 | 0.047 | 0.047 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | KK  | 3   | 0.040 | 0.049 | 0.046 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 5   | 0.038 | 0.049 | 0.044 |
| 1 | Indian w/Smo | Cav w/Spring | Springfield  | TL  | 1   | 0.242 | 0.242 | 0.242 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 4   | 0.079 | 0.169 | 0.114 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 103 | 0.070 | 0.270 | 0.116 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 39  | 0.066 | 0.280 | 0.129 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 22  | 0.085 | 0.240 | 0.139 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 71  | 0.082 | 0.281 | 0.137 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | DUD | 3   | 0.116 | 0.125 | 0.122 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 21  | 0.067 | 0.277 | 0.131 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 1   | 0.101 | 0.101 | 0.101 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 18  | 0.086 | 0.291 | 0.156 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 72  | 0.070 | 0.289 | 0.136 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 94  | 0.076 | 0.300 | 0.149 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 5   | 0.087 | 0.256 | 0.125 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 95  | 0.071 | 0.305 | 0.141 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 4   | 0.086 | 0.287 | 0.150 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 6   | 0.084 | 0.282 | 0.124 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 6   | 0.087 | 0.296 | 0.177 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 6   | 0.090 | 0.297 | 0.171 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 1   | 0.078 | 0.078 | 0.078 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 3   | 0.084 | 0.259 | 0.143 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 17  | 0.068 | 0.297 | 0.193 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 19  | 0.085 | 0.298 | 0.209 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | TL  | 1   | 0.082 | 0.082 | 0.082 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 16  | 0.103 | 0.297 | 0.188 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 66  | 0.070 | 0.297 | 0.160 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 7   | 0.082 | 0.277 | 0.219 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 2   | 0.118 | 0.301 | 0.210 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 6   | 0.108 | 0.292 | 0.230 |

### Gray 3-9 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 246   | 0.056     | 0.293     | 0.161     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 870   | 0.053     | 0.248     | 0.130     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 18    | 0.063     | 0.263     | 0.137     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 1016  | 0.064     | 0.248     | 0.120     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 252   | 0.072     | 0.309     | 0.178     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 91    | 0.061     | 0.245     | 0.111     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 17    | 0.073     | 0.256     | 0.137     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 215   | 0.069     | 0.291     | 0.140     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 110   | 0.076     | 0.314     | 0.166     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 16    | 0.062     | 0.140     | 0.097     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 26    | 0.074     | 0.246     | 0.124     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 16    | 0.071     | 0.248     | 0.125     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 24    | 0.053     | 0.181     | 0.112     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 3     | 0.127     | 0.244     | 0.183     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 6     | 0.061     | 0.171     | 0.126     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | MS     | 861   | 0.026     | 0.051     | 0.043     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | SUS    | 43    | 0.030     | 0.050     | 0.042     |
| 1    | Indian w/Bow | Cav w/Spring | 45CAL        | KK     | 6     | 0.032     | 0.043     | 0.039     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | TL     | 5     | 0.124     | 0.164     | 0.142     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 32    | 0.084     | 0.238     | 0.143     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 13    | 0.114     | 0.296     | 0.221     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 16    | 0.101     | 0.173     | 0.133     |

|   |              |              |              |     |     |       |       |       |
|---|--------------|--------------|--------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | KK  | 32  | 0.061 | 0.263 | 0.135 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | SUS | 8   | 0.091 | 0.264 | 0.160 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK  | 18  | 0.098 | 0.193 | 0.129 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | KK  | 7   | 0.080 | 0.218 | 0.131 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP  | 2   | 0.093 | 0.133 | 0.113 |
| 1 | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB | 6   | 0.079 | 0.174 | 0.129 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | DUD | 5   | 0.086 | 0.275 | 0.214 |
| 1 | Indian w/Sha | Cav w/Spring | Springfield  | DUD | 4   | 0.073 | 0.242 | 0.162 |
| 1 | Indian w/Spr | Cav w/Spring | Springfield  | SUS | 1   | 0.223 | 0.223 | 0.223 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | TL  | 3   | 0.149 | 0.221 | 0.177 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | DUD | 3   | 0.274 | 0.286 | 0.279 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield  | SUS | 5   | 0.141 | 0.259 | 0.222 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MFP | 5   | 0.036 | 0.049 | 0.041 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | TL  | 6   | 0.037 | 0.042 | 0.039 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL        | MOB | 2   | 0.040 | 0.048 | 0.044 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | MS  | 78  | 0.082 | 0.282 | 0.143 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | KK  | 25  | 0.080 | 0.286 | 0.183 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | KK  | 5   | 0.104 | 0.268 | 0.169 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | MS  | 75  | 0.079 | 0.252 | 0.159 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | MS  | 91  | 0.058 | 0.268 | 0.126 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | KK  | 22  | 0.110 | 0.281 | 0.180 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | MS  | 150 | 0.076 | 0.262 | 0.124 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | MS  | 28  | 0.059 | 0.262 | 0.129 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | DUD | 7   | 0.080 | 0.122 | 0.095 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | DUD | 3   | 0.108 | 0.136 | 0.122 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | MS  | 27  | 0.084 | 0.285 | 0.149 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | MS  | 96  | 0.089 | 0.296 | 0.173 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | KK  | 26  | 0.075 | 0.265 | 0.171 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | KK  | 25  | 0.070 | 0.270 | 0.165 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | DUD | 2   | 0.142 | 0.240 | 0.191 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield  | SUS | 3   | 0.103 | 0.164 | 0.123 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | KK  | 65  | 0.091 | 0.286 | 0.221 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | DUD | 3   | 0.124 | 0.254 | 0.180 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | SUS | 3   | 0.122 | 0.240 | 0.172 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield  | SUS | 10  | 0.248 | 0.273 | 0.257 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | SUS | 8   | 0.118 | 0.283 | 0.195 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield  | DUD | 2   | 0.239 | 0.277 | 0.258 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield  | SUS | 21  | 0.091 | 0.288 | 0.236 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield  | SUS | 7   | 0.242 | 0.278 | 0.259 |
| 2 | Cav w/Spring | Indian w/Win | Springfield  | SUS | 8   | 0.093 | 0.261 | 0.239 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield  | KK  | 5   | 0.118 | 0.281 | 0.233 |

### Gray 3-10 Direct Fire Effects

| Side | Shooter      | Target       | Ammo         | Effect | Shots | Min Range | Max Range | Avg Range |
|------|--------------|--------------|--------------|--------|-------|-----------|-----------|-----------|
| 1    | Indian w/Win | Cav w/Spring | Winchester . | MS     | 847   | 0.050     | 0.249     | 0.118     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | MS     | 188   | 0.062     | 0.269     | 0.127     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | SUS    | 5     | 0.097     | 0.242     | 0.153     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | MS     | 172   | 0.063     | 0.266     | 0.134     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | KK     | 17    | 0.060     | 0.255     | 0.135     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | SUS    | 16    | 0.060     | 0.163     | 0.109     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | MS     | 91    | 0.067     | 0.289     | 0.135     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | MS     | 186   | 0.058     | 0.258     | 0.127     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MS     | 908   | 0.060     | 0.209     | 0.126     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | KK     | 74    | 0.050     | 0.247     | 0.104     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | SUS    | 37    | 0.078     | 0.240     | 0.122     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | KK     | 24    | 0.064     | 0.252     | 0.110     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | KK     | 22    | 0.071     | 0.238     | 0.131     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | TL     | 4     | 0.085     | 0.118     | 0.101     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | KK     | 23    | 0.069     | 0.179     | 0.104     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | KK     | 28    | 0.060     | 0.238     | 0.111     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | TL     | 6     | 0.093     | 0.167     | 0.138     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | DUD    | 32    | 0.067     | 0.190     | 0.132     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | FP     | 3     | 0.079     | 0.127     | 0.101     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | SUS    | 6     | 0.068     | 0.237     | 0.130     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | TL     | 7     | 0.088     | 0.142     | 0.114     |
| 1    | Indian w/Win | Cav w/Spring | Winchester . | DUD    | 27    | 0.081     | 0.177     | 0.123     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MOB    | 4     | 0.100     | 0.119     | 0.107     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | DUD    | 4     | 0.093     | 0.138     | 0.112     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | DUD    | 5     | 0.074     | 0.224     | 0.126     |
| 1    | Indian w/Smo | Cav w/Spring | Springfield  | TL     | 7     | 0.067     | 0.252     | 0.149     |
| 1    | Indian w/Hen | Cav w/Spring | Henry .44 Ca | MFP    | 13    | 0.078     | 0.238     | 0.135     |
| 1    | Indian w/Sha | Cav w/Spring | Springfield  | DUD    | 2     | 0.086     | 0.184     | 0.135     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | SUS    | 3     | 0.092     | 0.144     | 0.120     |
| 1    | Indian w/Rif | Cav w/Spring | Springfield  | SUS    | 12    | 0.078     | 0.250     | 0.146     |
| 1    | Indian w/Spr | Cav w/Spring | Springfield  | DUD    | 2     | 0.108     | 0.144     | 0.126     |

|   |              |              |             |     |     |       |       |       |
|---|--------------|--------------|-------------|-----|-----|-------|-------|-------|
| 1 | Indian w/Spr | Cav w/Spring | Springfield | TL  | 3   | 0.097 | 0.254 | 0.173 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL       | MS  | 552 | 0.029 | 0.051 | 0.044 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL       | MFP | 6   | 0.035 | 0.050 | 0.043 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL       | SUS | 24  | 0.031 | 0.051 | 0.043 |
| 1 | Indian w/Rif | Cav w/Spring | Springfield | TL  | 2   | 0.176 | 0.255 | 0.216 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL       | KK  | 2   | 0.033 | 0.034 | 0.034 |
| 1 | Indian w/Bow | Cav w/Spring | 45CAL       | TL  | 6   | 0.038 | 0.050 | 0.044 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | MS  | 93  | 0.074 | 0.266 | 0.136 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | KK  | 31  | 0.062 | 0.223 | 0.162 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | TL  | 1   | 0.125 | 0.125 | 0.125 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | MS  | 86  | 0.069 | 0.258 | 0.136 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | MS  | 93  | 0.062 | 0.240 | 0.140 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | KK  | 31  | 0.056 | 0.234 | 0.163 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | MS  | 30  | 0.074 | 0.263 | 0.134 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | KK  | 35  | 0.068 | 0.232 | 0.164 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | MS  | 129 | 0.077 | 0.268 | 0.125 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | MS  | 40  | 0.066 | 0.273 | 0.136 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | KK  | 48  | 0.072 | 0.234 | 0.156 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | SUS | 7   | 0.071 | 0.229 | 0.152 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | DUD | 7   | 0.074 | 0.234 | 0.158 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | KK  | 13  | 0.076 | 0.235 | 0.159 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | MS  | 128 | 0.064 | 0.238 | 0.142 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | DUD | 8   | 0.055 | 0.261 | 0.148 |
| 2 | Cav w/Spring | Indian w/Win | Springfield | TL  | 2   | 0.111 | 0.116 | 0.113 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | DUD | 4   | 0.084 | 0.235 | 0.166 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | DUD | 1   | 0.158 | 0.158 | 0.158 |
| 2 | Cav w/Spring | Indian w/Hen | Springfield | SUS | 10  | 0.097 | 0.203 | 0.182 |
| 2 | Cav w/Spring | Indian w/Sha | Springfield | SUS | 10  | 0.073 | 0.235 | 0.200 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | KK  | 77  | 0.050 | 0.232 | 0.125 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | DUD | 6   | 0.067 | 0.183 | 0.133 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | KK  | 10  | 0.059 | 0.237 | 0.158 |
| 2 | Cav w/Spring | Indian w/Bow | Springfield | SUS | 10  | 0.101 | 0.213 | 0.142 |
| 2 | Cav w/Spring | Indian w/Smo | Springfield | SUS | 7   | 0.108 | 0.213 | 0.180 |
| 2 | Cav w/Spring | Indian w/Rif | Springfield | SUS | 5   | 0.119 | 0.217 | 0.177 |
| 2 | Cav w/Spring | Indian w/Spr | Springfield | SUS | 3   | 0.204 | 0.221 | 0.210 |

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